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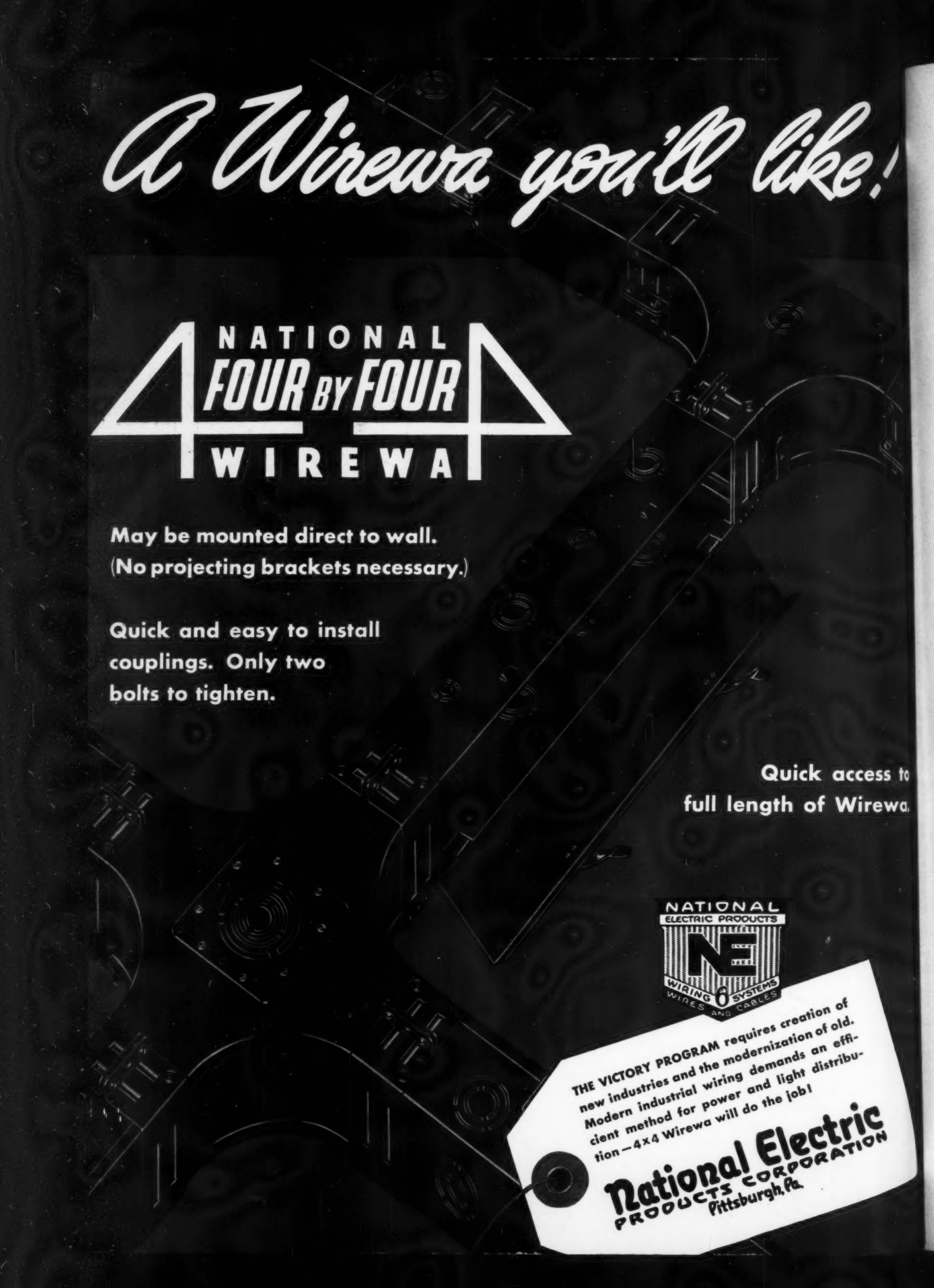
FACTORY

MANAGEMENT AND MAINTENANCE

A McGRAW-HILL PUBLICATION

JUNE 1942

McNUTT on MANPOWER · Page 58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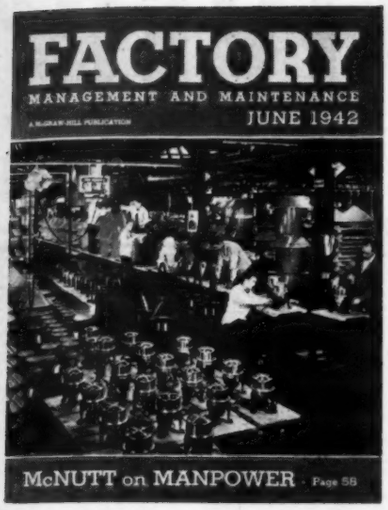

The air-raid siren whose shriek plunges your community into its next practice blackout may well have been made "on the production line" like most of the other materials of modern war. It certainly was if it is a Federal. For confirmation see this month's cover photograph in full color depicting operations in a conveyorized testing chamber. Kodachrome by courtesy of Federal Electric Company, Inc., Chicago.

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MANAGEMENT AND MAINTENANCE

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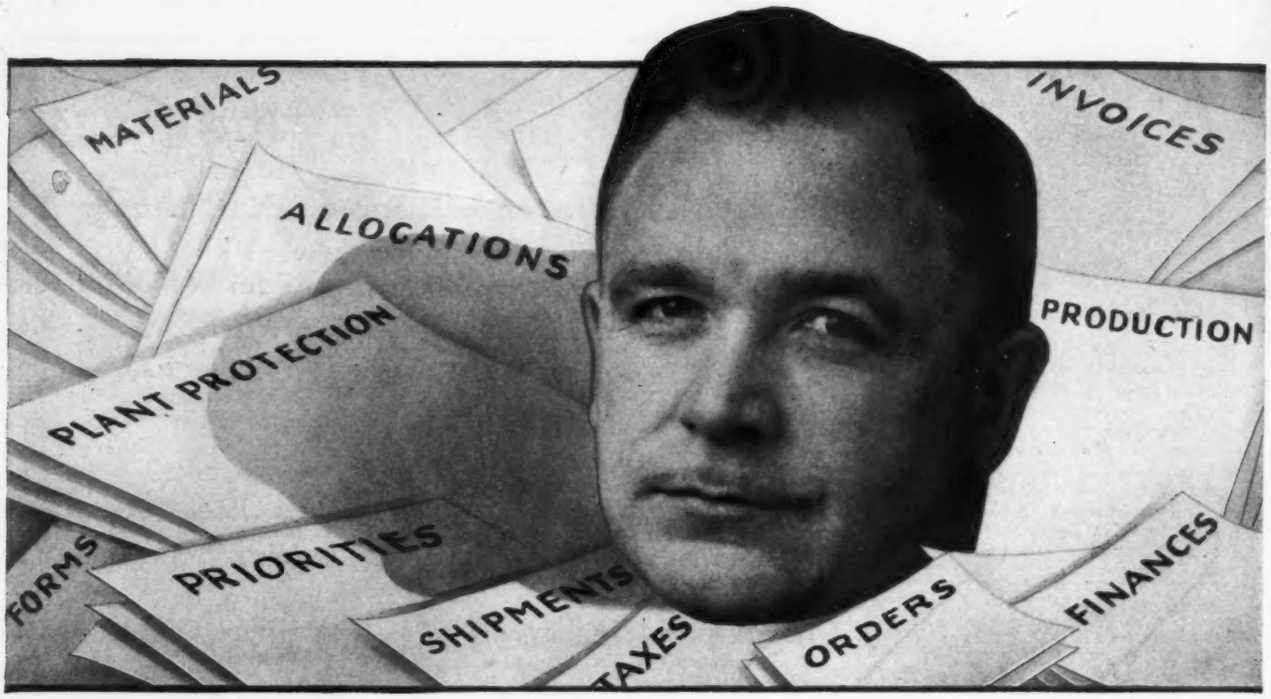
— says **R. C. HAGGERTY, Secretary-Treasurer**



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FACTORY
MANAGEMENT AND MAINTENANCE

L · C · MORROW · EDITOR

The Too-Much-Production Bugaboo

Ever since Donald Nelson made a certain radio talk, back in March, production drives have been growing in popularity and adoption. They are called by various names, but all of them aim at increased production per machine and per employee, and all depend very largely upon emotional appeals or, to use a commonly accepted term, improved worker morale. In many cases the results have been gratifying, and the plant managements quite properly have congratulated themselves upon having found the way to achieve too much production too soon rather than too little too late.

Oddly enough, "too much production too soon" has given production-drive campaigns a set-back. Whether the impedient is to be permanent or only temporary will depend upon the speed and conviction with which management develops and presents a logical explanation of why its plants should work at breakneck speed to turn out more goods for storage. That's where the rub is. Enough *bona fide* cases of parts or products rushed to completion and then stored in stockrooms, warehouses, and fields—or on docks—have come to the attention of plant personnel to cause lack of confidence in the alleged need for intensified production.

The explanation of why there should be no let-down in production is simple, but it may be hard to present in convincing fashion. The fact is, pile-ups exist because the national planning and scheduling program is out of balance. And no reflection upon the planners is intended. Even the job of determining the over-all requirements for the war has been difficult. But to determine the breakdown in individual products and those products in individual parts, so that each plant will be evenly balanced within itself and with all other plants, has been impossible. There was no crew of planners and production controllers, in Washington or out, capable of doing that job. Nor could the time have been available if there had been.

As our production goes on and on, however, bottlenecks will be broken, and tremendous drafts will be made with great suddenness upon the very stockpiles that now are being questioned. As America's special war factories and converted plants get into full production, and as our ocean transport increases, the flow of war goods will tend to keep shipments even with production. With the lives of our armed forces—even our success in the war—at stake, temporary out-of-balance should be disregarded.

No, the need for production has not let up. Nor has the need for effective production drives. A step has been added, though, in some cases—the job of maintaining a high employee morale in the face of growing stockpiles.

L C Morrow

How America Must

Prepared especially for *Factory*

By PAUL V. McNUTT

Chairman, War Manpower Commission

Editor's note: Just as this article goes to press it is announced that Mr. McNutt will "freeze" labor in critical war plants. Thus begins the unfolding of the manpower program for which the author is responsible. Told here are the things he most wants understood by America's plant operating executives

LET US BEGIN with definitions. "Manpower mobilization" is an awesome, resounding sort of phrase, with many meanings to many men. Unless we define it carefully, there is danger that it may lose meaning altogether.

Does it mean the brutal ruthlessness with which Hitler's henchmen are despoiling the human resources of their own and the conquered lands? Does it mean the peremptory shuffling of lives and energies to which the Japanese submit?

No. To me manpower mobilization, in America, can mean only one thing: *free men marching together.* To me it means the "big parade" on the home front, the greatest demonstration of organized cooperation by government, management, and labor in the history of this or any nation.

And that is what we shall witness, I believe, when we recognize the danger we face.

The danger of which I speak, the really grave danger, is this: We may be suddenly caught short at the very crest of our war effort by a lack of manpower—not merely of skilled manpower or of military manpower, but an absolute scarcity of *people*, of men and women to do the jobs that need to be done.

This we must at all costs avoid. The speed and effectiveness with which we act on our manpower problem today can, quite literally, spell the difference between victory and defeat, freedom and slavery, tomorrow.

Our task is to forge a gigantic fighting force, backed up to the limit by a healthy, hard-hitting civilian working force completely reshaped in the mold of war. Mobilization, on the home front, means the strategic disposition of this working force so that there shall be no idleness, no waste motion, and so that not one precious manhour of skill shall be misspent.

That is the task to which President Roosevelt has assigned the War Manpower Commission, of which I am chairman.

You want to help in that task. I know that you do. The letters that come to my desk every day tell me that all the elements of our population are ready and eager to submerge personal interests in cooperative action. And America's industrial management, which has already written a magnificent record in the annals of production, is no exception.

In the coming manpower program, management's part, your part, will be one of the most vital of all.

You want, then, to know how you can help. I welcome this opportunity to tell you all that I currently can about that. I shall try to give you some forecast of events as they will

WHAT MANAGEMENT MUST DO

1. Fight both pirating and hoarding of labor
2. Utilize all local sources of labor supply
3. Hire and train people of the reserve types
4. Intensify in-plant training programs
5. Be scrupulous in requesting deferments of needed workers
6. Emphasize health and safety in the plant

...st Use Its Manpower

affect you. And I wish most earnestly to ask your understanding of the problems involved as we approach this task together.

If there is one point that I want, above all, to get across to you in this first, formative period, while policy is still in the making, it is this: *I hope you will act affirmatively and at once to rebuild the personnel structure of your plants in the pattern of war.* In general this means the hiring and training of people drawn from the nation's labor reserves. We shall define this policy more fully as we go along. Most of you understand it quite clearly and many of you have a good, fundamental beginning.

Now I believe we shall understand one another better if we face frankly the question of compulsion. I am asked whether we plan to "draft" labor and management, to regiment them, pick them up and put them down, and order them about in true totalitarian fashion.

We certainly do not. The idea of that kind of compulsion is as abhorrent to me as it is to you. As a public servant I have been trained in the ways of democracy. All my thinking has been cast in the tradition of "the greatest good for the greatest number," of government "by consent of the governed."

Yet I should be rash indeed to de-

"In the War Manpower Commission, every relevant element of government is represented." Seated, left to right: Donald Nelson, WPB; Claude R. Wickard, Agriculture; Chairman McNutt; Frances Perkins, Labor; J. V. Forrestal, Navy. Standing: Wendell Lund, WPB; Goldthwaite H. Dorr, War Department; Maj. Gen. Lewis Hershey, Selective Service; Arthur Altmeyer; Arthur S. Flemming, Civil Service; Fowler V. Harper. Altmeyer and Harper, not members, are Executive Officer and Deputy Chairman

clare that there is no prospect whatever of regulation of the nation's manpower. Even when free men march together someone must make plans, chart the route, and give commands.

Even then, however, there will not be "compulsion" in the totalitarian sense. For those who are most seriously affected will *wish* to be directed, will go willingly to the posts to which they are assigned. I doubt that there is any limit to the sacrifice and cooperation that the people of a democracy will display when faced with danger. In Australia every major holiday has been canceled, and there is strong talk of the conscription of industrial workers at Army pay. Great Britain has long had an emergency regulation empowering the Minister of Labour to "direct any person to perform such services as the Minister thinks he is capable of performing." This is *carte blanche* for the conscription of management, and it is so used.

Labor priorities prevail in England also, under the Essential Work Order. I am frequently asked whether labor priorities are likely to be adopted here. My reply is that they are virtually unavoidable. This becomes plain when we take the measurements of the problem before us.

Margin Is Slim

As a yardstick, let us begin with the 54,000,000 persons who comprise our normal total labor force. Not all of them are usually employed, of course. Many have been unemployed for years. A certain portion, probably above 2,000,000, are unemployable. Against this, the total working force grows as the population grows, about 600,000 a year.

Our yardstick is not exact, we know, but it gives us a starting point. Total employment is currently 50,400,000. Subtract this figure from the labor force and it is plain that we have a margin of no more than 3,600,000 unemployed. Available reserves not usually in the labor market were listed at 13,300,000 in a recent WPA survey, but this total consisted of 7,600,000 housewives, students, and others who had not been working heretofore, and 5,700,000 who could work part-time only.

Approximations will suffice because they make my point so clearly. The point is that the margin is wholly inadequate when compared with requirements. By the end of the year, according to the best estimates of my staff statisticians, *we must add 10,000,000 workers to those already engaged in war work.* In this figure I am including those in the factories and a percentage of those in transportation and utilities whose work is a part of the war effort.

We need look no further ahead than January 1, 1943, therefore, to visualize a very critical situation. These 10,000,000 additional war workers alone will wipe out the mar-

gin remaining from the normal labor force, to say nothing of the scheduled increases in the Army and in the Navy.

Clearly we shall have to begin soon to draw sharply upon the national "labor reserve" of 13,300,000 persons. This figure includes 6,500,000 housewives, 1,100,000 students and younger people, and 5,700,000 older persons and partially disabled persons who would not usually be considered as part of the labor force. How deeply we shall have to invade these reserves, only time will tell. But it is plain that every continuing day of the war will make the necessity more acute. Probably we can draw about 2,000,000 from this reserve force this year, with shifts from non-essential civilian industry making up the bulk of our war industry recruits.

Priorities Inevitable

Do these facts not make labor priorities seem inevitable? You will agree, I think, that they do. And you will agree also that, in any scarcity, an unregulated market is certain to cause chaos. I am confident, therefore, that when controls become necessary you will comply willingly, just as I am sure that labor will cooperate cheerfully.

Now let us consider, for a moment, the history of our recent experience with priorities on raw materials. You all recall the familiar pattern. First measurements were taken and a shortage was foreseen. This was debated, for a time, *pro* and *con*. Then followed a period of confusion until the predicted scarcity made its appearance. Then the government began putting clamps on the market to keep it from going wholly beyond control.

We can avoid that this time! We have a wonderful chance to establish the intelligent regulation of our labor supply far more smoothly, in much less time, and on a vastly more voluntary basis than any other priorities system in the history of the war effort.

We *know* our requirements. There is no question about our shortage. And best of all we have ready at hand the machinery for dealing with our problem. To begin with, in the War Manpower Commission every relevant agency of government is represented. Now let me mention just a few of the government agencies that will be at our service, under the President's Executive Order of April 18.

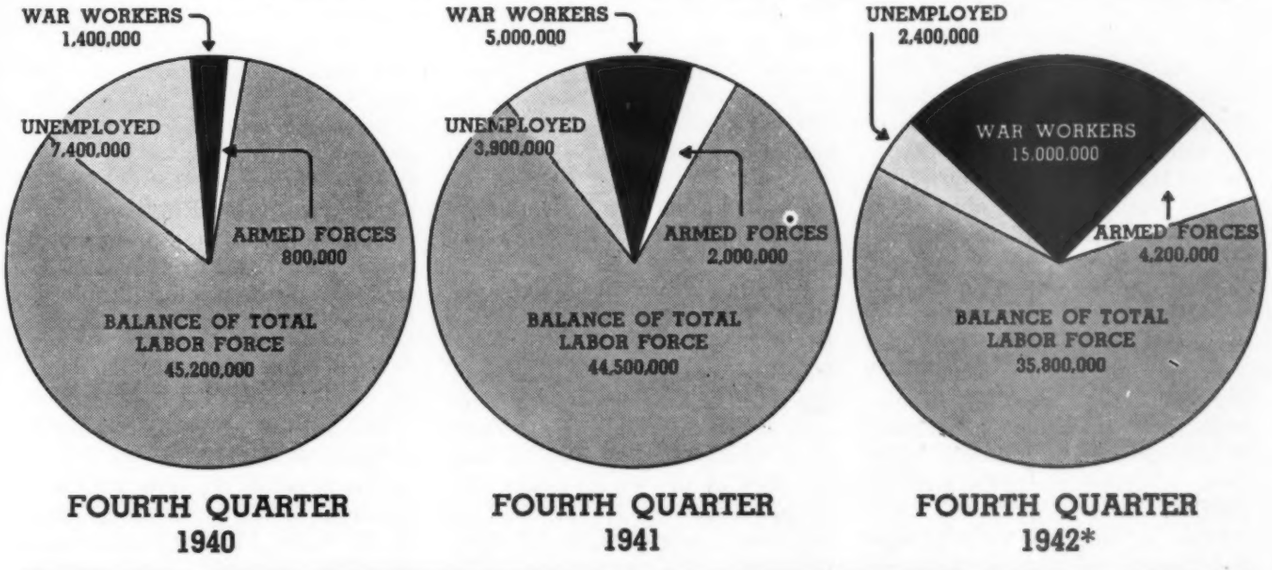
We can get facts. We shall have at our disposal the statistical branches of the Federal Security Agency and the Labor Department. We can get action. The recently federalized United States Employment Service will be the very hub of our control system. It is a real organization with 22,000 employees in 4500 full- and part-time offices. It is already equipped to handle industry's personnel supply work locally and nationally. It has at its disposal the catalog of 18,000 occupational skills by which it can accurately classify applicants—something we never had in the first World War.

Plus this we have a far-flung training system through which 3,000,000 persons have already received some form of training. The coordination of the many federal, state, and local agencies engaged in training is well-nigh complete. The system is ready to expand in coordination with industry's needs as ascertained by our fact-finding groups.

Destinies of Millions

Grave issues remain to be decided. We shall have to learn how to define what is "essential," the term applied to the serious responsibility of deciding the destinies of millions. We shall have to learn how to shift thousands of workers and their families from one part of the country to another while protecting their health and providing them with housing. We shall have to decide how this shall be arranged and how paid for. We shall have to settle the question of deferments for skilled workers. I am naming only a few of

HOW WAR IS SHIFTING U. S. MANPOWER



Source: U. S. Bureau of Labor Statistics **Bureau estimates*

the major policy decisions that confront me as Chairman of the War Manpower Commission.

I cannot now tell you what decisions will be made, but I can assure you that the government is going to be in a position to do every necessary thing to insure a victorious balance of armed strength, military production, and essential civilian production.

And I can say this as earnestly as I know how: *Your part in this task begins with NOT waiting to see what the government will do.* There are many specific things which every management can and must do now to prepare industry for the emerging changes which we can already foresee. By doing so, you will be helping us to postpone compulsions and perhaps to avoid many of them altogether.

Things You Can Do

What I am asking for is a *positive attitude* on your part, an aggressive determination to do those things that you know are needful and—yes, for this is war—to see that others do them. Now, bearing in mind that we are planning for a long war, and talking on a long-range basis, here are some of the things you can do.

Specifically, let us speak first of labor "pirating." This is an ugly word, but I must use it to describe the madness and folly of the labor raids that are going on today. Pirating and its handmaiden, labor "hoarding," must stop. I realize that I am speaking of a guilty minority. I realize that some of the offenders are under heavy pressure to produce at all costs. And yet I say that we must regard these practices as we would any other deeply unpatriotic act. They should arouse our indignation, for they are exactly like the hoarding or misuse of rubber, steel, or any vital material upon which the lives of Americans may depend.

I hope these practices can be stopped by industry itself on a voluntary basis. Pirating does *not* solve the manpower problem for the individual plant or for the nation. It complicates that problem. It does not increase production. It disrupts production. It does not stabilize economic conditions. It contributes to the spiral of inflation.

Begin in your own plant to fight these practices affirmatively. But don't stop there. Use your influence among your industrial associates. Use the strength of your manufacturers' associations. Make offenders unpopular. Make them *feel* their mistakes. Industry can, if it will, stamp out pirating and hoarding.

Another specific point: Please utilize *local* sources of supply. Draw on the labor reserves nearest you. Do not discriminate against negroes and certified aliens. Analyze your operations. Look for places where you can use women, older people, and handicapped workers. I am aware of the cost factors and other obstacles that have made management so selective in its choice of workers in the past, but I submit that no such factors should influence you in this time of national emergency.

Let us say that you have jobs to be filled. You have combed your own files to no avail. Now you are thinking of advertising in faraway newspapers or of sending men to other cities to find the men you need. Don't do it. First get in touch with the nearest office of the United States Employment Service. It can help you find the workers locally available. Otherwise it can locate them at the nearest available point—with a minimum of expense to you. Finally, it can help you discover the most likely sources of reserve manpower in your local area.

Is there any spectacle more absurd than that of personnel "scouts" leaving local labor reserves behind them and actually passing each other in the night on trains bound back and forth between the West Coast and the Middle West? Is either one adding anything to his own or industry's total labor supply? On the contrary both are causing cruelly foolish loss of time, money, and production. They are simply postponing—or they think they are postponing—the day, now at hand, when manufacturers will be compelled, not by the government or by any other factor than absolute necessity, to dig deep into the labor reserves of their home communities.

Shortage Insurance

The management that discriminates in hiring or otherwise overlooks local sources is simply depriving itself of a form of insurance against the shortages of the future. When transportation difficulties increase, those managements will fare best whose employees

FOUR KEY MEN IN M

Fowler V. Harper, Army-Navy Welfare head, becomes Deputy Chairman of Manpower body

Commission's Executive Officer, Arthur Altmeyer, retains post as Social Security Board Chairman

John J. Corson, crack personnel man, heads vast organization of United States Employment Service

Nation's huge training task has been ably handled by Brig. Gen. F. J. McSherry, formerly of WPB

have the shortest distances to travel.

The day of ready-made manpower is past. And this brings us to the third specific policy which I recommend to you. Not only must you hire women, handicapped workers, older workers, negroes, and certified aliens in numbers heretofore undreamed of, but you must be prepared to train them. When we really dig into our labor reserves we shall be dealing with millions who have never worked in industry and, in fact, with millions who have never worked at all. Government training agencies will intensify and expand their activities to the utmost, but they cannot solve the problem alone.

More Upgrading

In-plant training is industry's answer. Industry has done much, but it must do much more to upgrade skilled workers to the very maximum, to utilize every skilled worker at the highest level of his skill. Ready-made supervisors have vanished, too. They must be made *in the plant*.

Here is another of the ways in which you can help. You must remember that the armed services do not want to cripple production by taking really necessary men until they can be replaced—any more than you, if you want to win the war, would think of keeping men, if they were not really needed. It is your duty to obtain deferments for necessary men, to scrutinize your operations carefully, and file your 42-A form with local boards, after a study as careful as any you would make, for example, in determining piece rates or in negotiating a labor agreement.

Here is still another way in which you can help. Please emphasize plant health and safety programs as never before. We simply cannot afford the continued loss of 400,000,000 man-days of production annually through accidents and illness. The emergency has, in fact, increased the need for vigilance in the plant. Community health facilities will be strained by the withdrawal of doctors and nurses for service in Army and Navy. And in the plant the accident hazard will rise with the large numbers of inexperienced workers employed at unfamiliar tasks.

To sum up, these are management's duties in the manpower mobilization program: (1) Fight both pirating and hoarding of labor; (2) utilize all local sources of labor supply; (3) hire and train people of the reserve types; (4) intensify in-plant training programs; (5) be scrupulous in requesting deferments of needed workers; (6) emphasize health and safety in the plant.

Perhaps I have given you what may seem to be a rather strong set of instructions to follow. They are no stronger, I assure you, than the times require. This is not a day for namby-pamby language on any topic. Nor am I singling out industrial management for a special lecture to the exclusion of all other elements of the war effort. These injunctions are addressed to you because I happen to be speaking to you through FACTORY, a management magazine, and I am speaking no more vigorously than I might speak to labor through a labor publication.

At all events, I believe I am right in assuming that you *want* to take the initiative in adopting policies that will help to win the war. I am equally certain that labor will cooperate gladly, that the individual employee will willingly accept any assignment he is given, and that the labor unions will help to facilitate every necessary movement of manpower from plant to plant or city to city.

Learning to Ration

This is just one illustration of the many ways in which we, as a people, are learning to put our old, peacetime conceptions on the shelf. We have had to accustom ourselves to scarcity—scarcity of steel, copper, rubber, tin, and hundreds of other things. It was not easy at first because the very idea of scarcity was so new, so hard to "get."

But once we understood it, we tightened our belts and began to ration, to conserve, to salvage, to substitute. Now we are showing the arrogant scoffers of the Axis that we are not so soft, helpless, and disorganized after all.

In the same way we shall learn to ration our manpower supply. If I have accomplished nothing else in this article, I hope I have made it plain that a manpower shortage confronts us. For once you understand it, I know you will do your part in the mobilization task.

CASE STUDIES in

AMERICAN INDUSTRY is now carrying the fight to the Axis. Under a variety of banners and slogans, labor and management are marching together toward victory in the battle of production.

From Donald M. Nelson's aides in War Production Drive Headquarters at Washington come reports of the formation of nearly 1000 joint management-labor committees. Undoubtedly the number of plants engaged in some form of production drive is much larger than that.

Meanwhile not only WPB but also the War Department, the Navy, the Maritime Commission, and the British Purchasing Commission are laying plans for more vigorous encouragement of the winning spirit in industry. In many a plant an Army "A" may soon fly beside the Navy "E," and in others a British "B" will be awarded for distinguished lend-lease service.

No further proof is needed of the scope and sweep of the movement first described in earlier issues of FACTORY. By all signs the movement has just begun to grow. And, while industry will welcome all the help it can get from Washington, it is now fairly clear that industry's own initiative will be the factor that finally "puts over" the national effort to increase production. As a further service, FACTORY continues, in this article, its reports on techniques and methods being developed by companies engaged in building "the will to win."—THE EDITORS

CASE STUDY NO. 1—New Departure

THREE BAD ACTORS—Inefficiency, Lost Time, and Accidents—came to a deservedly sudden end on the big parking lot of the New Departure Division of General Motors at Meriden, Conn., on the sunny afternoon of May 5.

Not a single tear was shed by any of the 12,000 townspeople and New Departure employees who saw the trio, after due "trial," hanged by the neck until dead. Instead the crowd cried "Hang the rats!" long before the prosecuting attorney had finished reciting the long list of their crimes.

The "rats" were oversized effigies of Hitler, Hirohito, and Mussolini. They danced prophetically in the breeze as, one by one, they were hoisted aloft by John Curry, plant superintendent, Joe Bogucki, union representative, and Charles Parker, plant safety chairman.

Thus began New Departure's intensive and comprehensive 13-week war production drive, which has already won the praise of WPB Chairman Donald Nelson. Employees who, during the drive, report promptly for work and maintain their present high production schedules will, at the end, receive "Victory Production" certificates signed by Plant Manager Milton L. Gearing and suitable for framing.

Nothing was spared to make the "hanging" memorable. Elaborate invitations went forth in the form of folders containing cardboard cutouts from which Adolf, Hirohito, and Benito dangled on the end of a string. Came the big day—and a big parade.

To a dirge played by an American Legion band, the three culprits, caged, were escorted to the scaffold under the personal supervision of "Uncle Sam." A jury of twelve was followed by the three "hangmen." A thoughtfully ordered hearse brought up the rear.

Hear the prosecuting attorney as he denounces the criminals:

"Meriden-made bearings are the

Edged in mourning, envelope, above, held invitation which, when open, revealed dangling figures of Hirohito, Benito, and Adolph

Building the Will to Win

very heart of mechanisms that keep planes flying, Navy guns firing with the accuracy for which they are noted, and Army tanks, trucks, and jeeps rolling at high speed. It therefore becomes a duty to remove from our midst any and all recognized handicaps to high productive output."

Army and Navy officials nodded in approval, and newsreel cameras clicked as the crowd roared in response:

"Hang the rats. Production will do it!"

The triple attack on inefficiency, lost time, and accidents remains the theme of all the clever follow-up material designed to carry through the campaign. Russell Patterson, noted illustrator, prepared the series of thirteen posters, each of which hits at some phase of inefficiency.

Each poster bears the ironical heading: "Do you want to lose the war?" and an equally laconic subheading which tells how to lose the war. Examples: "Just loaf in the washroom,"

Came the day. 12,000 citizens of Meriden cheered as labor and management men strung up enemy effigies. Hanging, preceded by parade and "trial," launched production drive

"Be careless . . . Have an accident . . . You'll get compensation," or "Stay away from work . . . You got a pocketful of dough."

Concurrently a series of pay envelope stuffers, like these shown herewith, keep driving home the same themes. Typical messages: "Lost time would make so happee. Thanks, please Hirohito," and "Yah, for accidents I will give nice medal, Adolf."

The plant sound system is also used for patriotic recordings and music.

Drive Against Spoilage

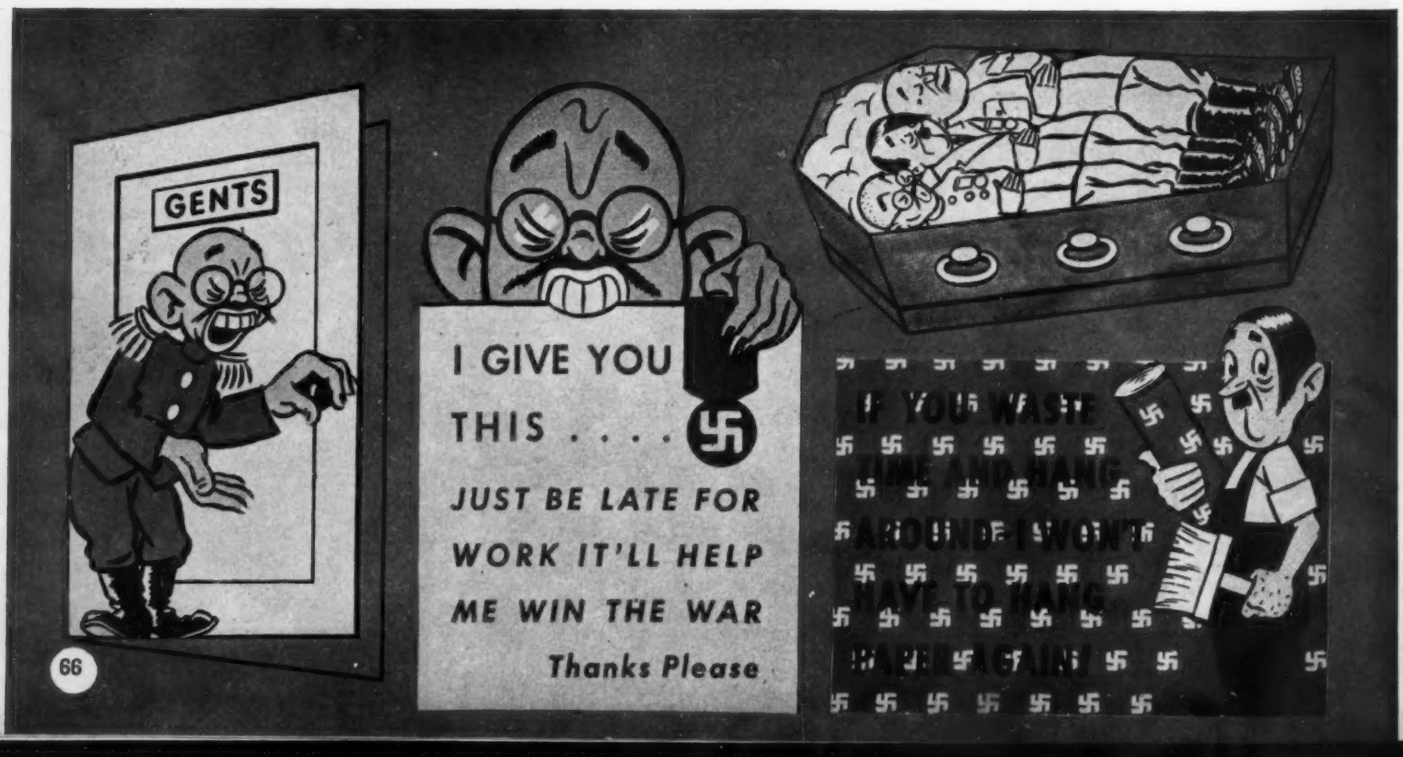
Production sights have been raised by New Departure as the drive gathers speed. The suggestion system has been intensified. Payments for adopted suggestions will in general be equal to one month's value of the savings effected. In the plant, meanwhile, a new drive against work spoilage has been launched under the slogan "Let's make bearings and not scrap." Departmental scrap heaps are compared in size from week to week while supervisors impress upon workers the lesson that 150 operations and many man-hours of work may go into the making of a single bearing before it is spoiled. Again, a broken bearing may be displayed with the legend: "This was scheduled to go into a bomber."

In all these activities, the campaign is thoroughly backed up by editorial material, cartoons, and articles in the company's well-edited "New Departure News."

DO YOU WANT TO LOSE THE WAR?
Then let 'em stop you when you suggest a better, faster way to do your job.
FORGET IT SON...THE OLD WAY IS GOOD ENOUGH...BESIDES IT'LL MAKE OUR JOBS LAST LONGER.
It takes guts to sell a new idea. But if better ideas were never sold our boys at the front would still be using bows and arrows.

Novel pay envelope stuffers are keyed to triple theme. Most are folders. Coffin at right has cover. Jap at left points obvious moral

Triple attack on inefficiency, accidents, and lost time is theme of weekly New Departure posters specially designed by Russell Patterson


GENTS
I GIVE YOU THIS . . . . JUST BE LATE FOR WORK IT'LL HELP ME WIN THE WAR
Thanks Please
IF YOU WASTE TIME AND HANG AROUND I WON'T HAVE TO HANG AROUND AGAIN

CASE STUDY NO. 2—Walter Kidde & Co.

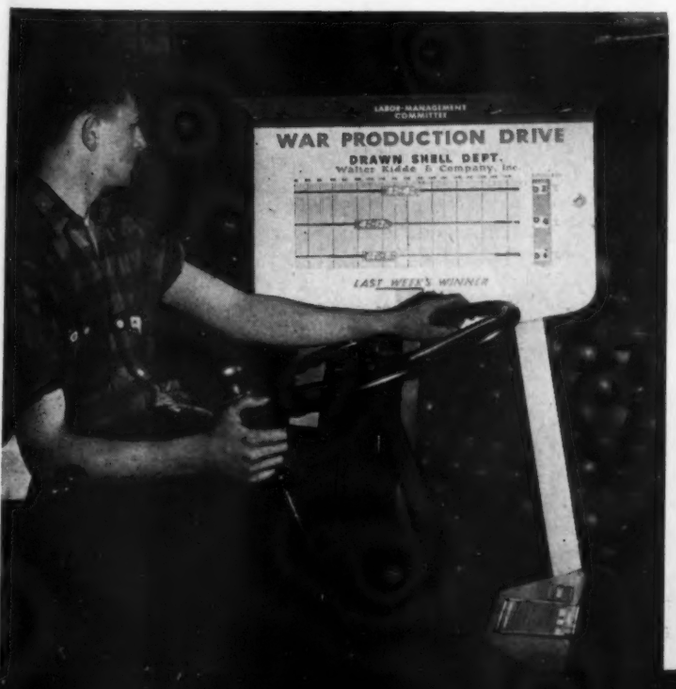
WORK SIMPLIFICATION plays a major part in the war-production-boosting program of this Bloomfield, N. J., manufacturer of vital fire-fighting and inflation equipment. The labor-management committee conducted preliminary studies in efficiency methods before launching its drive. Scoreboards, posters, and suggestion boxes are also used.

In a special machine shop, Kidde employees follow through their own suggestions experimentally.

A scoreboard "wrinkle" is the daily, weekly, and monthly index of production by all three shifts, with a related daily report on spoilage, carried by the big plant board. Departmental scoreboards provide closer breakdowns. Committees, one for each of four plants, work well, help to unify personnel—all comparative strangers since working force has increased 600 percent in one year.

Big scoreboard shows daily progress. Figures are imaginary. Board was new when photograph was taken

Departmental scoreboards are constant reminders of drive throughout plant, arouse competitive spirit



Neatly arranged stand distributes war drive literature chosen by labor-management committee

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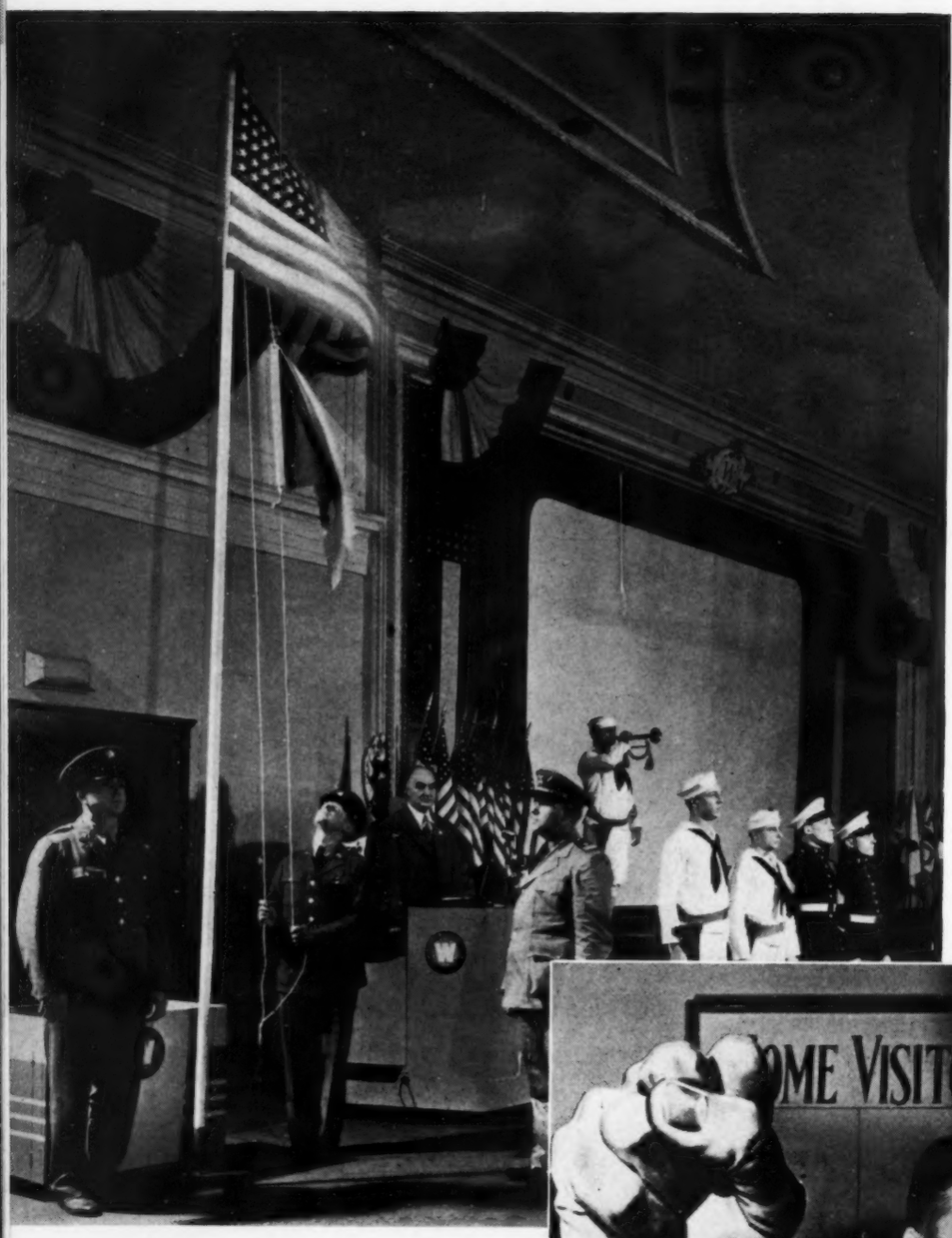
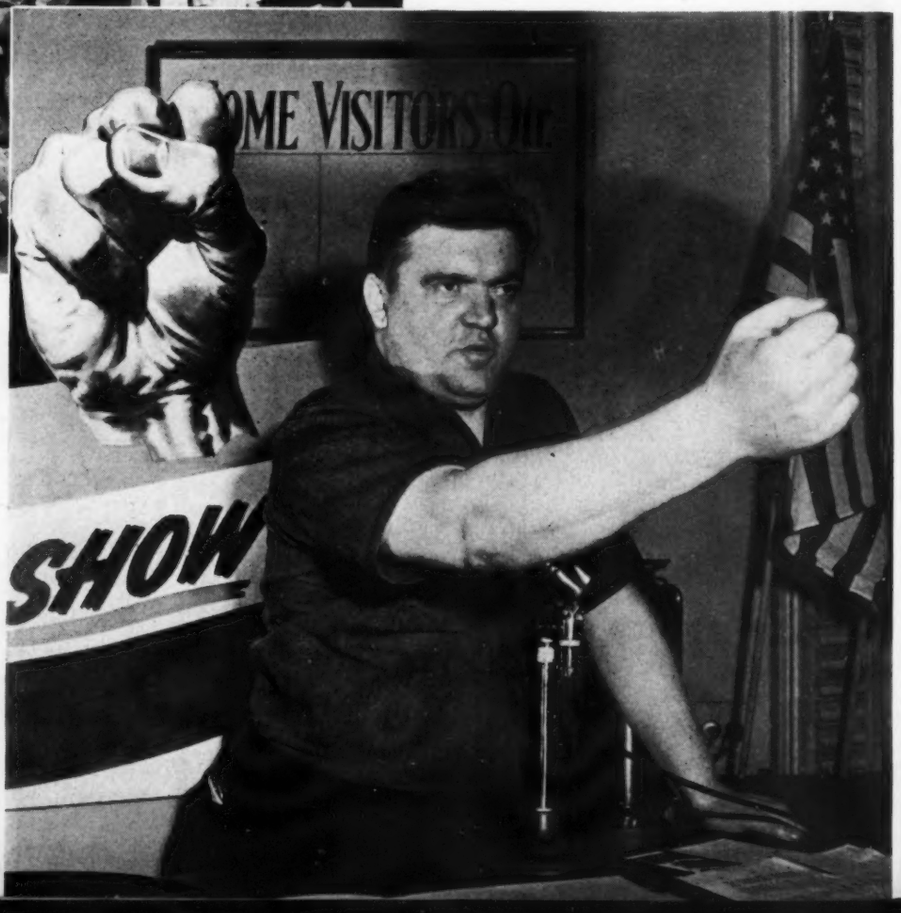
CASE STUDY NO. 3—Westinghouse



Impressive ceremony marks presentation of divisional flags at successive rallies attended, 1000 at a time, by Westinghouse workers in E. Pittsburgh plants



Enthusiasm rises as this labor member of committee challenges his fellows with slogan, "Let's Show Them!" Speech climaxes a thrilling film show, precedes presentation of flag at rally

THE SLOGAN at East Pittsburgh is "Let's Show Them!" An upraised fist is the symbol, denoting a smashing extra effort by thousands of war-conscious Westinghouse workers.

A three-day series of rousing rallies, held "around the clock" and attended by employees in groups of 1000, launched the drive sponsored by a joint labor-management War Production Drive Committee.

Real showmanship and a keen sense of psychology were displayed in the 30-minute rallies. Each one, by a colorful combination of music, films, ceremony, and oratory, built steadily to a sure-fire climax. So skillfully conceived was the program that the individual rally was certain to succeed despite the fact that each one involved different speakers and different audiences.

FACTORY cites the Westinghouse case as an especially instructive example well worth close study by other managements. The man to get in touch with for further details is J. M. McKibbin, Manager of Sales Promotion and Training at East Pittsburgh. Here, in outline, is the way the rallies were staged:

The plant band played as the workers sang "America." Labor and management representatives spoke briefly, reminding employees of the 1000

Here are two in the series of hard-hitting posters (above) in "Let's Show Them" production drive

Westinghouse men now in uniform. Then came a rapid-fire slide film driving home the fact that Westinghouse products—outwardly the same as in peacetime for the most part—have actually "gone to war."

Then came the highlight, a well-made motion picture or newsreel type. "Yamanto's" rasping threats brought jeers, which changed to cheers at sight of MacArthur, Roosevelt, and Westinghouse Chairman A. W. Robertson. All voices joined in songs thrown on screen. Climax was presentation of department flags by Naval officers.

When production "teams" are ahead of schedule, their flags will fly on the same staff with the Stars and Stripes. Second feature of the initial drive will be "public recognition plus cash awards" for the best production-boosting suggestions. The "Let's Show Them!" theme will be kept aloft as follow-up of drive transfers emphasis to lost time, waste materials, and accident prevention. Pledge cards are issued but are not signed and returned. Instead, the wearing of a "Let's Show Them" button signifies that the worker has mentally pledged cooperation.

CONTINUED ON NEXT PAGE

Rousing songs (right) stir added spirit at rallies. Buttons and pledges are distributed to workers

LET'S SING!

(Tune) THE MARINES HYMN

From the halls of Hirohito
To the bastions of Berlin
We will back our nation's fighters
With the arms they need to win
Yes, the Army and the Navy
And United States Marines
Can be sure that we're behind them
With our Westinghouse machines.

(*Shout*) LET'S SHOW THEM!

(Tune) ANCHORS AWEIGH

Anchors aweigh my lads!
Let's show our might.
Work will win victory
So in there lads and *fight, fight, fight, fight,*
Flags up the staff my lads!
Let's show them how
Westinghouse can slap the Jap . . .
So *up* production, *up* production, now!

(*Shout*) LET'S SHOW THEM!

(Tune) THE CAISSONS GO ROLLING ALONG

Through the day, through the night,
Make them *fast* and make them *right!*
Keep production a rolling along.
At your lathe, at your bench,
With your hammer or your wrench,
Keep production a rolling along.
For we've Japs to lick
And machines'll do the trick!
Shout out your chorus loud and strong!
Not tomorrow, but TODAY
If you're Westinghouse you'll say:
Keep production a rolling along,
Keep production a rolling along.

(*Shout*) LET'S SHOW THEM

KEEP THIS SHEET FOR FUTURE USE

Ideas From Other Cases

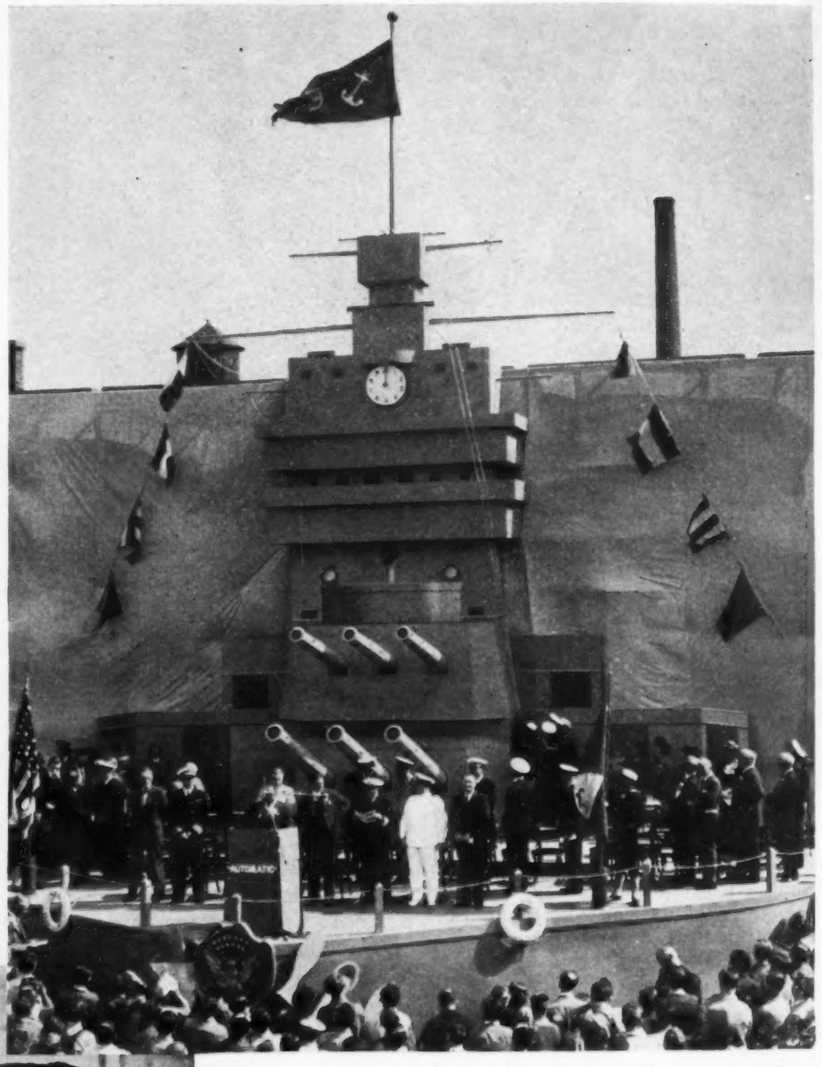
THE NATIONAL DRIVE to awaken the "will to win" in America's war industries has unleashed a flood tide of Yankee spirit and ingenuity. Its principles clearly established, the production campaign's methods and techniques now come to the fore.

In apparently unlimited variety, new ideas are being brought forth in plant after plant from coast to coast. The objectives are the same—to stimulate production; to reduce waste, accidents, and lost time; to make employees feel the grim necessity for speed; to combat damaging rumors, gossip, and dissension.

But in the councils of management-labor committees and in the alert minds of advertising, personnel, promotion, production, and public relations executives, the plans for attaining these objectives take as many different forms as there are plants to adopt them.

For example, at Packard Motor a handsome departmental citation flag is awarded "for production merit" to schedule-beating departments whereas those who fall behind receive a cheap, cheesecloth banner bearing a familiar device, the eight-ball, with the legend, "Now behind the Eight-Ball, but Next Week?????"

At Cooper-Bessemer Corporation, Mount Vernon, Ohio, life-size figures



It's a replica! High and dry on Chicago's West Side this business-like "battleship" formed the colorful setting for Navy "E" award to Automatic Transportation Company, division of Yale & Towne. Over 3000 spectators applauded as prize pennant was run up

Another idea! And it was only one of over 2000 that poured in during the "MacArthur Month" drive at Bausch & Lomb Optical Company, Rochester, N. Y. With "Think, Work, Save" as their watchword, the employees came through with a 500 percent increase in suggestions to win doubled awards, $5000 in cash

of Hitler and Hirohito are suspended in a foundry ladle in front of a large production scoreboard beneath which is the slogan, "Make It Hot for Them!" The management-labor committee of this company, by the way, has invited a host of subcontractors to participate in its production drive.

At Independent Pneumatic Tool Company, Aurora, Ill., a little Jap comes out from behind the scoreboard, whenever production lags, to thank everyone for helping him. At Crocker-Wheeler Electric, Ampere, N. J., the scoreboard that records the receipt of new suggestions takes the form of a ladder at the top of which a Japanese soldier perches precariously. As the total suggestions increase, the figure of a workman climbs the ladder carrying an acetylene torch closer and closer to the enemy at the top.

At Westinghouse Electric & Manufacturing Company, Bloomfield, N. J., a sea of people, 6500 in number, flooded the newly named "MacArthur Plaza" for the "Victory Rally" which launched a production drive. Cecil Brown, war correspondent, spoke; Lucy Monroe, radio star, sang; the Fort Monmouth Army band played; Army and Navy officials took part; and an attractive "Westinghouse Suggestion Girl" unveiled the new street signs.

At Girdler Corporation, Louisville, punching bags with the unpopular faces of Hitler and Hirohito painted on them are hung within convenient reach of workers with the slogan: "Sock 'em twice, boys—here and at your job! Turn the tide!" At American

(*Continued on page* 188)

Edison Industries employees at West Orange, N. J., rally 'round with contributions for attractive "Work to Win" suggestion box (above)

Forward march! Packard Motor's management-labor committeemen, above, inspect novel battlefield scoreboard. White lines mark the plant divisions as the "armies" advance toward production goals

If production lags, the Jap comes out from behind scoreboard to voice his thanks at Aurora, Ill., plant of Independent Pneumatic Tool Company where "Produce the Plus" is the slogan

Do's and Don't's for New Executives

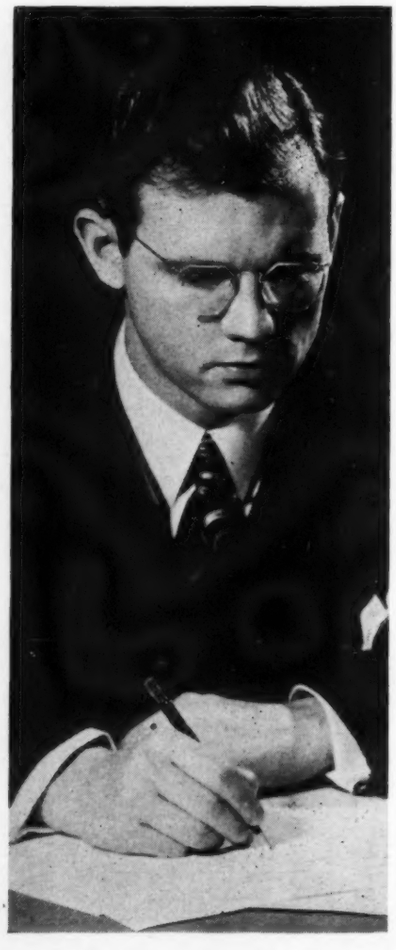
DILLON STEVENS, Chairman, Board of Directors,
The Plomb Tool Company, Los Angeles

Have you, like the young man below, moved ahead so fast that you often wonder what to do and what not to do? For you — and the hundreds like you in industry today, an older hand at management offers sound counsel

UNDER WAR CONDITIONS, business is creating new young executives at an unusually high rate. Possibly "create" is the wrong word. It might be better to say it is "advancing" many to managerial, department head, and junior executive status at a fast rate and often without the usual period of trying and testing, of training and experience. Industry is necessarily promoting them into such positions faster than the man or his organization ever anticipated.

Many of these men have moved ahead so fast that they find themselves wondering what to do and what not to do in many of the situations of business life. Many who have been denied an "apprenticeship" to their new responsibilities would like some first-hand advice out of the book of experience and observation of men who have been longer in such capacities. Some might even like a few simple, yet fundamental, "do's" and "don't's" to which they could turn. It is because I have been answering the questions of some such young men that the idea of putting down a few of these "do's" and "don't's" occurred to me. From my own experience, I believe some of these "do's" and "don't's" may be helpful to all, and all may be helpful to some.

It is my purpose to talk of simple things in the hope that some good may be accomplished. My readers should remember that these "do's" and "don't's" are not all written for men who have come from the office, and they're not all written for men who have come from the shop—nor yet for the men who are directly out of college, lacking experience in either office or shop.



Some Simple Do's

Because the first impression we create on each person we meet is the visual impression, give thought to your appearance. It is well to dress and to wear your hair and to shape your other characteristics of appearance in a manner conforming with what appears to be a good standard for the job or position in which you find yourself. Observe the dress and appearance of older and successful men in similar jobs. Pick out one who has earned your respect and use him as a guidepost—not necessarily to be copied but as a standard at which to aim.

After appearance, the next personal characteristic that affects those about you favorably or unfavorably is your manner of speech. This can be broken into three subheads:

1. *Voice.* You may never have given thought to your voice before, but now is the time to think of it and, if you are really aiming at success, it is time to cultivate a voice that will be an asset. Your voice is one of the principal and most important tools of your new status. Train your voice to be firm, pleasing, and convincing. As this is not a treatise on voice, I will leave these thoughts with you. The method of accomplishing it is one of your jobs.

2. *Choice of words.* Clarity of expression will be like the good tools in the hands of a good mechanic. It will produce results. Lack of clarity will result in botched and sloppy work, even as will dull or uncared-for tools of a mechanic. There is an axiom that you can bury deep in your consciousness: "If an instruction or order can be misunderstood, it *will* be misunderstood." Remember that words are now the tools of your trade. This includes both the spoken and the written word. Know your words as a workman knows his tools. Make them your tools, and use them as a master craftsman would, and you will be effective. But be you ever so smart, you will not get results if you cannot convey your knowledge, your desires, and your instructions to others. Your words are the sole means of doing these things. Make yourself their master.

3. *Expression*—manner of speaking, vehemence. Use moderation to get the greatest force. Avoid extremes—extremes weaken rather than strengthen what you are saying.

It seems almost needless to mention that you have a face. It is your display board. It is controlled by a great many muscles which, presumably, you control. It has been said that the world is a mirror and that it gives back to you the re-

(Continued on page 202)

Guided by three-dimensional sketches, girls at Douglas Aircraft Company quickly become expert assemblers

Using Isometric Drawings to Speed Assembly

AN OLD IDEA with a brand-new name is currently simplifying the task of converting certain airplane plants from job-shop to mass-production methods. It is being used successfully at Douglas and Vega, to name a couple of names. The Training-Within-Industry Division of WPB has it under observation. It can be applied in any plant that uses assembly lines for the mass production of war materials—in any plant that must train new people quickly in assembly techniques. It need not be adopted for the duration only; it will have widespread peacetime uses.

The old idea is the three-dimensional, cutaway drawing long used in manufacturers' catalogs to show buyers how products are built, and to instruct them in the proper installation, operation, and care of equipment.

The brand-new name is "production illustration."

"Production illustrations," says C. T. Reid, director of education at Douglas, "bust the bottleneck of blueprint reading requirements for our assembly lines." They reduce assembly time, he adds, and slash costs.

"Present acceleration of production," testifies E. L. Reynolds, a superintendent, "makes it virtually impossible to use the old type of drawings while inducting and training new men. With production illustrations we can start a new and comparatively untrained man immediately."

Ruel Short, a fuselage assembler, has been with the company only four or five months. He used to be a salesman for a wholesale grocery concern. He had the necessary mechanical aptitude, but no actual experience in airplane assembly work. Says he:

"I honestly don't know how I could have got along without the help of production illustrations."

Throughout the Douglas plant,

judging by the number of assemblers "caught in the act" of checking something against a production illustration, it is evident that these drawings are saving time, speeding up the work, and helping to eliminate errors. Most of the people on the assembly lines have had no previous training. Most of them could not read an engineering drawing when hired. They are just average Americans, technically unskilled, but doing jobs vital to the war effort in a skillful way—without long and expensive training. Because of a new-old idea, a new technique applicable in all types of industries using assembly lines to put war goods together, they have been hastily gathered and quickly taught—and are now "in there pitching" for all they are worth.

Just what are these production illustrations? Simple, easily understood three-dimensional or isometric drawings, often of the cutaway type, that depict the operations necessary to assemble the component parts of a structure, so that the average worker, after a few moments' study, understands precisely what the results of his work will look like, and how to achieve those results. They show assemblers what to do, how to do it, and what tools to do it with.

A notable difference between the production illustration and the usual engineering drawing is the former's total lack of written dimensions. There is no need to clutter up the sketch with them. The parts shown are already formed. It makes no difference to the assembler whether the part he is working with is a sixteenth or a thirty-second of an inch thick. All he needs to know is where it goes, how to attach it where it belongs, and what tools to use in so doing.

Tests Show Savings

Two years ago—Douglas has been using this method since 1937—a check was made to determine the time saved. On a given job the allowed time was 9.15 hours, being the observed time taken by an experienced man. A new man on the day shift, without previous experience or supervision, took 7.2 hours. The initial time saving was therefore 1.95 hours, which the company has found from experience can be further reduced.

At Vega similar tests have been made. In one, two crews were assigned to assemble the right- and left-hand wing spars. One crew, with an isometric sketch, completed the first unit in 1.9 hours. The other, without a sketch, took 5.4 hours. On this specific operation the saving in time therefore amounted to nearly 70 percent.

Production illustrations, although used primarily on the assembly line to cut training time, are also useful in planning the order of assembly. Figure 1, for example, is a typical production breakdown of a Douglas light bomber, and shows major assemblies. Other drawings visualize the entire fuel system, an inboard wing flap (Figure 2), an outer wing section, and so on.

A Case Example

Figures 3 to 8 illustrate the kind of drawing an assembler works from. The example chosen is the door for a bombardier's compartment in a bomber. (To comply with censorship regulations an obsolete assembly has been selected for examination.)

Figure 3 depicts five assembly operations, each joining two or more preformed parts. Arrows point to the assembly of a small part to a big one. In the parts list, under the station letter, will be found the list of parts, by number, for these operations, each list being grouped under the number the operation carries on the drawing.

In Figure 4 the parts shown in Figure 3 are put together as shown. A few moment's study helps to identify the assemblies started in Figure 3. Workers get the required parts, rivets, and tools to do the complete assembly, and by following the illustration and the instructions can put the door together. Figure 5 shows the door with the outer covering or "skin" riveted to the frame. In Figure 6 the door has been turned over. At this station the emergency pull handle is installed. Two assemblies marked A and B in Figure 6 are shown enlarged in Figure 7.

Finally in Figure 8 the pre-formed inner side cover or skin is shown, and instructions for mounting are given. (For convenient presentation, parts lists and instructions have here been separated from the drawings. In actual practice these five sketches plus lists and instructions make a single production illustration that measures approximately 12x48 inches.)

At Douglas Aircraft Company, production engineer N. V. Karstens (with dividers) and his first assistant, John Noble, examine a production illustration aimed to help a new man on the assembly line to understand exactly what the results of his work will look like, and to show him in detail how he is going to attain those results

Ruel Short, former salesman for a wholesale grocery concern, became efficient fuselage assembler after a month or two on the job. He was aided by production illustrations. "Don't know how I could have got along without them," is the Short comment

William E. Kuhnly, on the Vega assembly line, checks isometric drawing of a center section leading edge while LaVeene T. Larson and Vernon D. Henry rivet a bulkhead. Drawing shows assemblers what to do, how to do it, and what tools to do it with

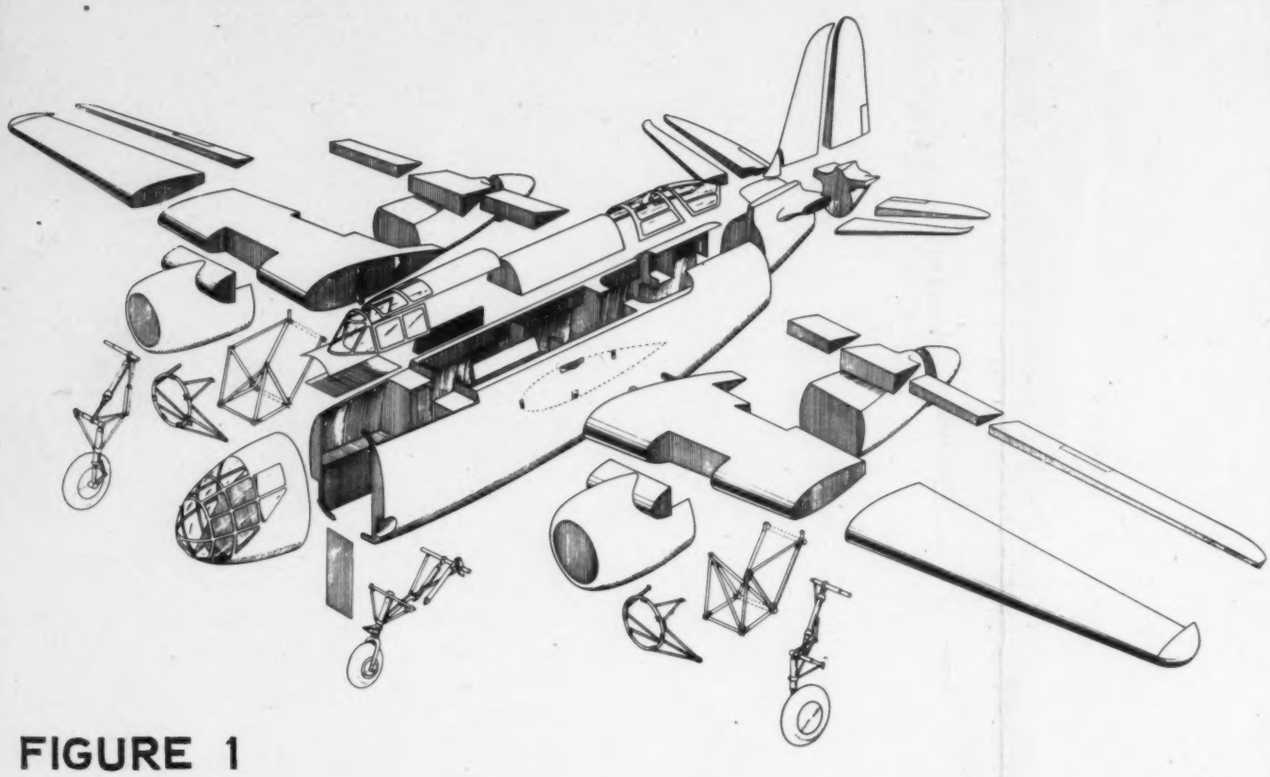


FIGURE 1

Figure 1. Production illustrations are used at the Douglas plant not only by assembly workers but also by company engineers in planning the flow of work. This one breaks down a light bomber into major assemblies. For obvious reasons, obsolete drawings were selected for use with this article

Figure 2. Typical isometric drawing shows breakdown of the inboard wing flap of a Douglas light bomber

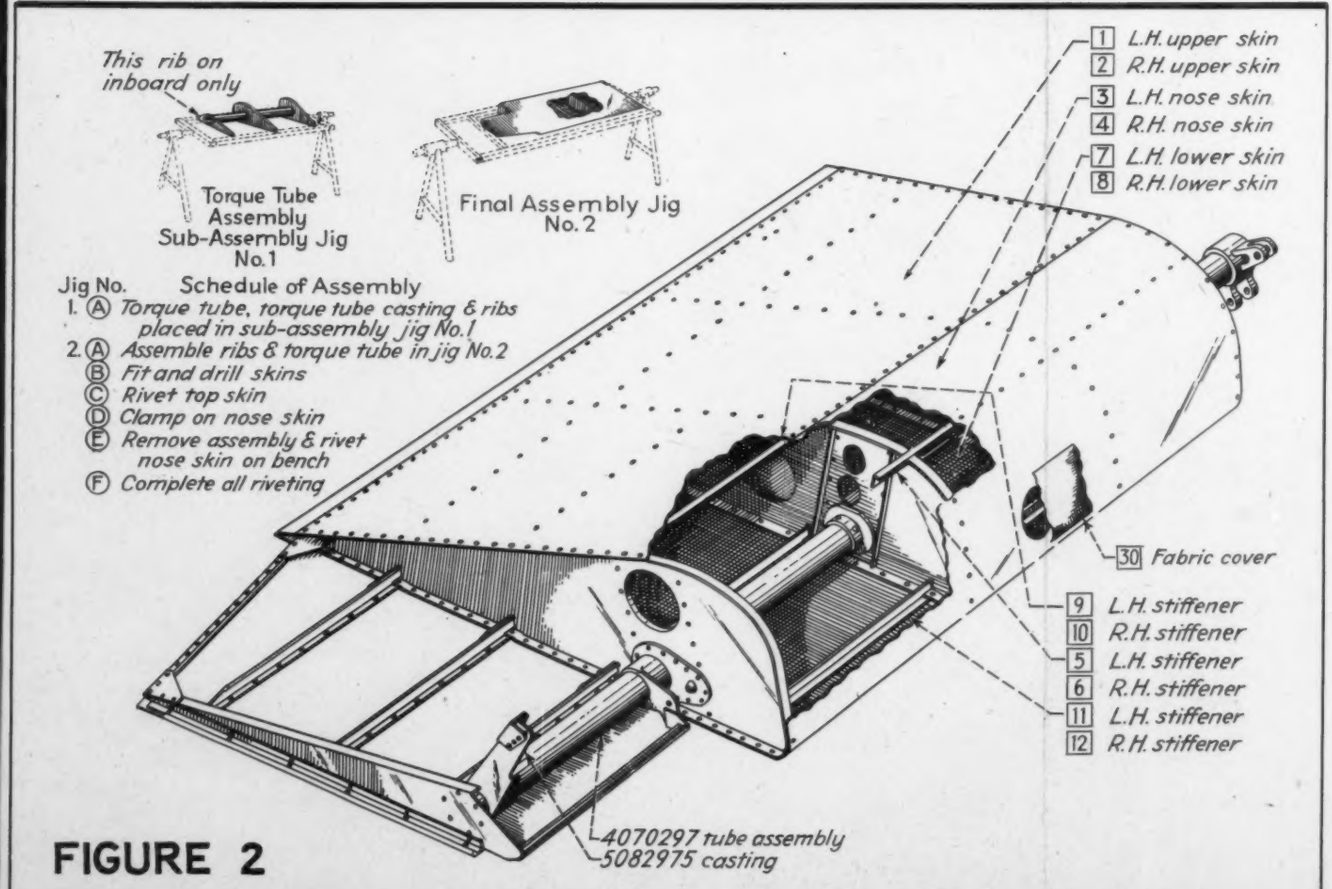

This rib on inboard only
Torque Tube Assembly Sub-Assembly Jig No.1
Final Assembly Jig No. 2
Jig No. Schedule of Assembly
1. Ⓐ Torque tube, torque tube casting & ribs placed in sub-assembly jig No.1
2. Ⓐ Assemble ribs & torque tube in jig No.2
Ⓑ Fit and drill skins
Ⓒ Rivet top skin
Ⓓ Clamp on nose skin
Ⓔ Remove assembly & rivet nose skin on bench
Ⓕ Complete all riveting
1 L.H. upper skin
2 R.H. upper skin
3 L.H. nose skin
4 R.H. nose skin
7 L.H. lower skin
8 R.H. lower skin
30 Fabric cover
9 L.H. stiffener
10 R.H. stiffener
5 L.H. stiffener
6 R.H. stiffener
11 L.H. stiffener
12 R.H. stiffener
4070297 tube assembly
5082975 casting

FIGURE 2

Bombardier's Lower Door

STATION A

Oper. No.		No. Req.
1. 5068858-400	Subassembly	1
5068858-38	Plate	1
5068858-10	Zee (rivet top 5 holes only)	1
2. 5068858-402	Subassembly	1
5068858-28	Plate	1
5068858-30	Channel	1
3. 5068858-404	Subassembly	1
243492-3	Angle	1
5068858-12	Channel	1
4. 5068858-406	Subassembly	1
243492-3	Angle	1
5068858-24	Channel	1
5. 5068858-408	Subassembly	1
5068858-14	Channel	1
5068858-20	Channel	1
5068858-22	Channel	1
5068858-26	Channel	1

STATION B

1. Assemble door in jig with Yates clamps and drill holes with No. 30 drill.

STATION C

Rivet frame together in the following sequence:

1. Rivet −16 to −66
2. Rivet −18 to −66
3. Rivet −16 to −64
4. Rivet −18 to −64
5. Rivet −16 to −48
6. Rivet −18 to −48
7. Rivet −400 to −4
8. Rivet −404 to −4
9. Rivet −400 to −6
10. Rivet −404 to −6
11. Rivet −406 to −408
12. Rivet −404 to −408
13. Rivet −404 to −406
14. Rivet −408 to −16
15. Rivet −406 to −16
16. Rivet −400 to −40
17. Rivet −404 to −40
18. Rivet −16 to −40
19. Rivet −18 to −40
20. Rivet −400 to −2
21. Rivet −404 to −2
22. Rivet −16 to −46
23. Rivet −18 to −46
24. Rivet −400 to −32
25. Rivet −404 to −32
26. Rivet −16 to −32
27. Rivet −18 to −32
28. Rivet −400 to −8
29. Rivet −404 to −8
30. Rivet −8 to −402
31. Rivet −32 to −402

NOTE: Oper. No. 16, 17, 18, and 19 are riveted top and bottom only. The middle flush rivet is riveted after oper. 31.

STATION D & A

Oper. No.		No. Req.
1. 1069361	Fairlead (rivet to −400 and −18)	2
2. 5068858-56	Angle	1
5068858-62	Phenolic Door Stop	1
3. 5068858-44	Hinge (station A)	2
5068858-42	Filler Plate	1

NOTE: The following plate is jig-drilled only in this station and is attached in station E.

5068858-68	Top Cover Plate	1
4. 5068858-70	Flannel (under 1059858)	1
1059858	Support	1
2068530	Bearing	1

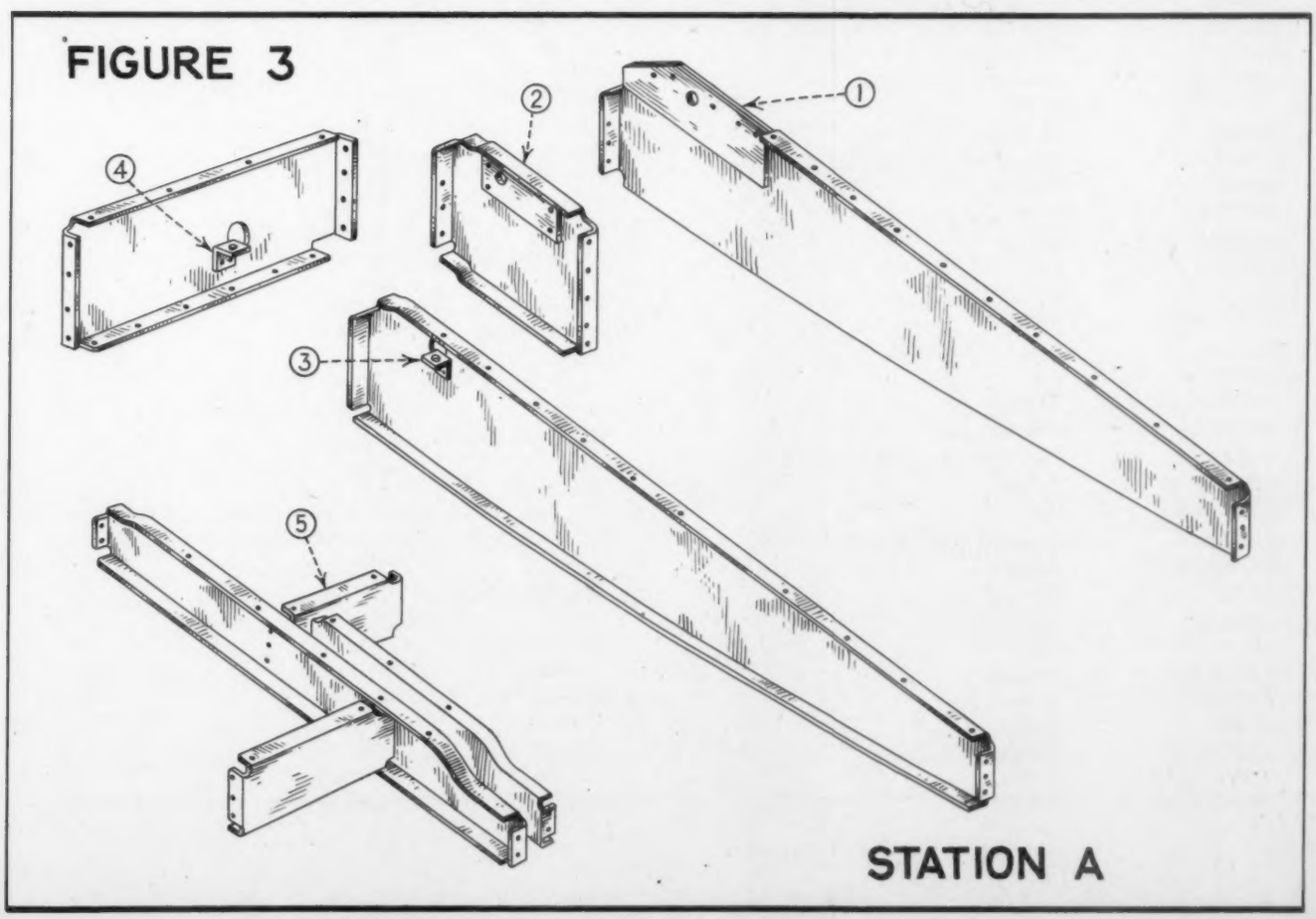
NOTE: The above are riveted to 5068858-50 which is then riveted to the door.

5. 5068858-50	Bottom Cover Plate (sta. A)	1
6. 5068858-52	Angle L.H.	1
5068858-54	Angle R.H.	1
5068858-72	Angle	1

INSPECTION NOTES

1. Inspect frame structure set up in jig occasionally.
2. Inspect frame structure for assembly, riveting, clearances, cracks, fairing, parts, and general condition.
3. Inspect location and alignment of holes for door lock handle shaft in −408 subassembly.
4. Inspect bottom cover plate for installation, fit, riveting, trim, parts listed, and general condition.
5. Inspect fairleads for cracks.

Figure 3. This sketch and the succeeding five make one production illustration as used on Douglas lines



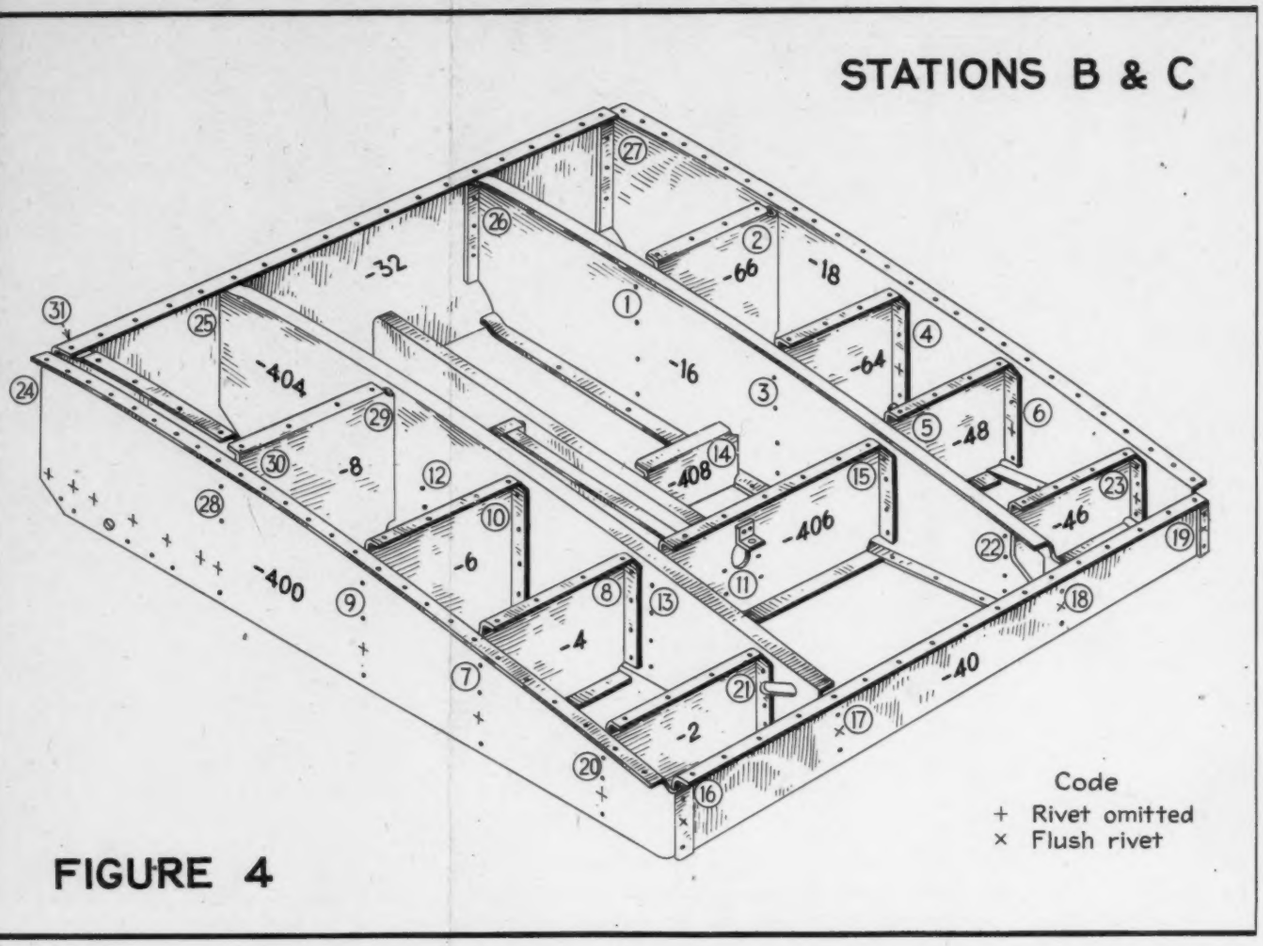


FIGURE 4

In Figure 4 (above), parts in Figure 3 have been put together. In Figure 5 (below), door is shown with outer "skin" riveted to frame. Accompanying instructions show what to do and how to do it

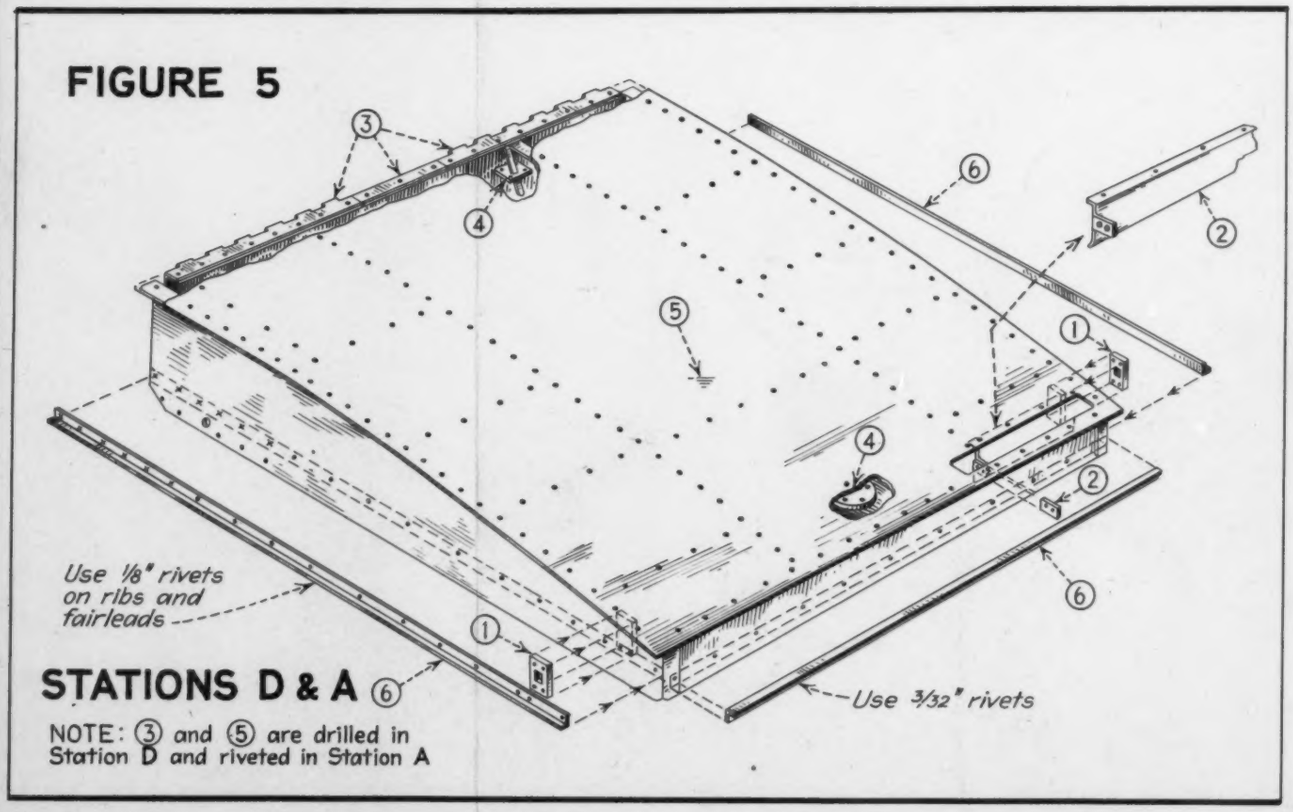
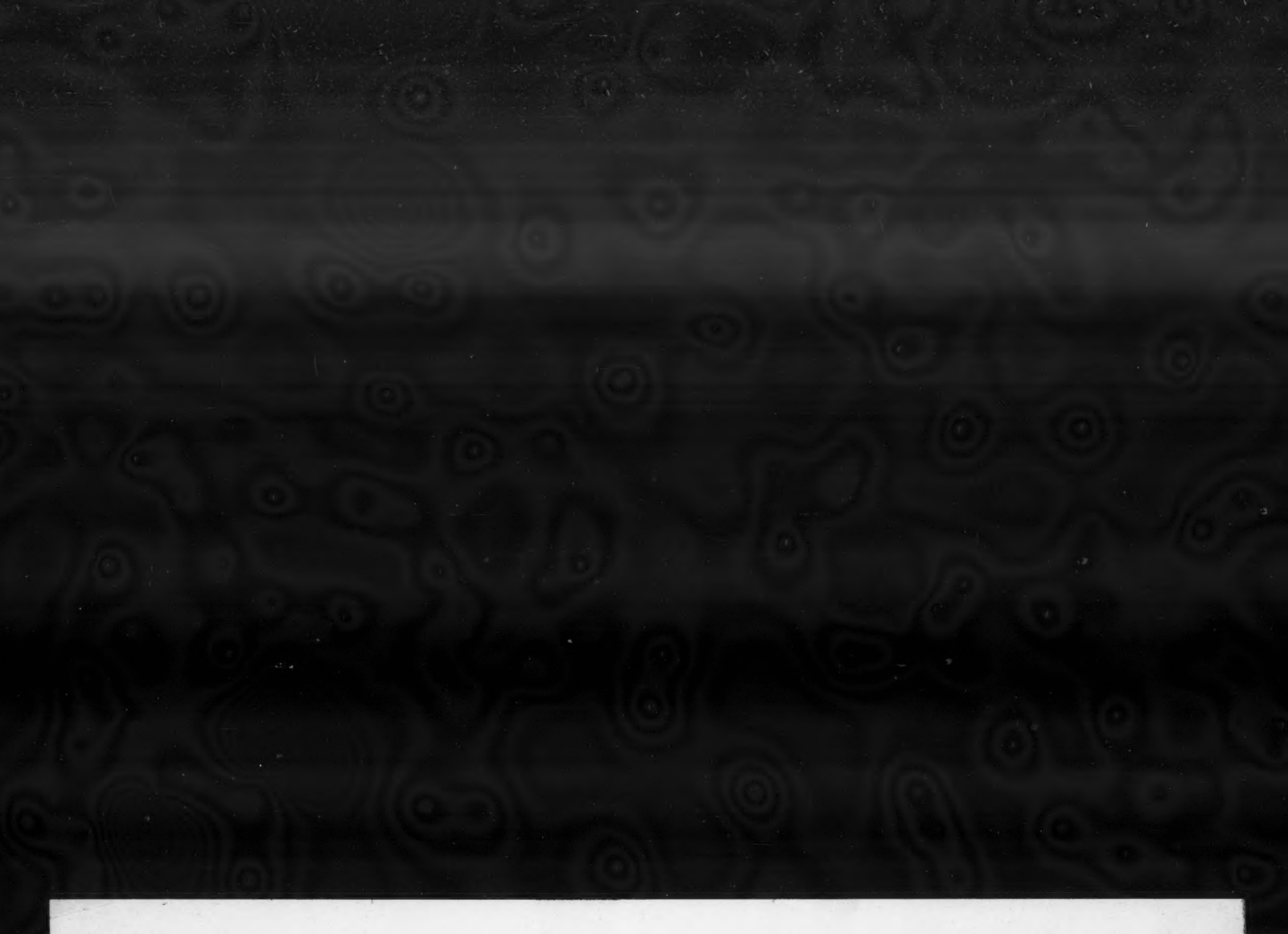


FIGURE 5
Use 1/8" rivets on ribs and fairleads
Use 3/32" rivets
STATIONS D & A
NOTE: ③ and ⑤ are drilled in Station D and riveted in Station A

CONTINUED ON REVERSE SIDE



STATION E

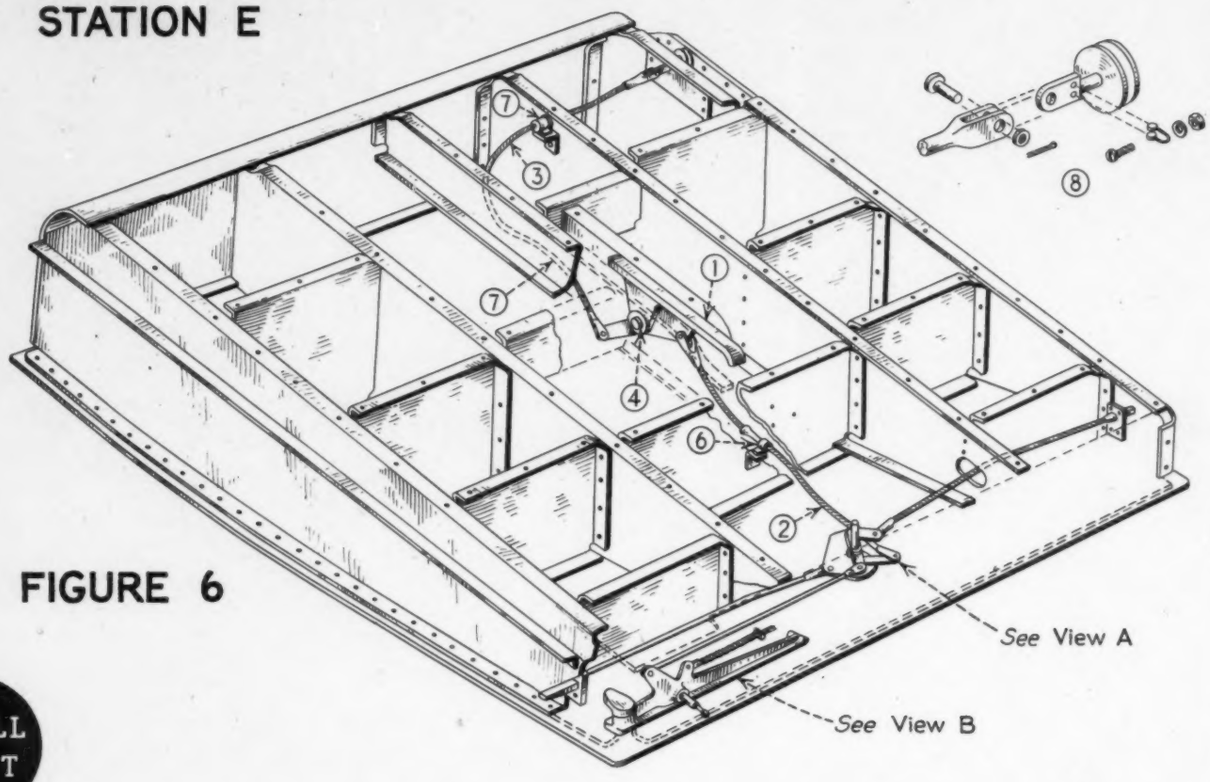


FIGURE 6

PULL OUT

Figure 6 (above). The door has been turned over and emergency pull handle is now to be installed. Below, in Figure 7, assemblies marked A and B in Figure 6 are enlarged. And in Figure 8 across the page, the preformed inner skin is shown mounted. Instructions for assembly are given directly below Figure 8

FIGURE 7

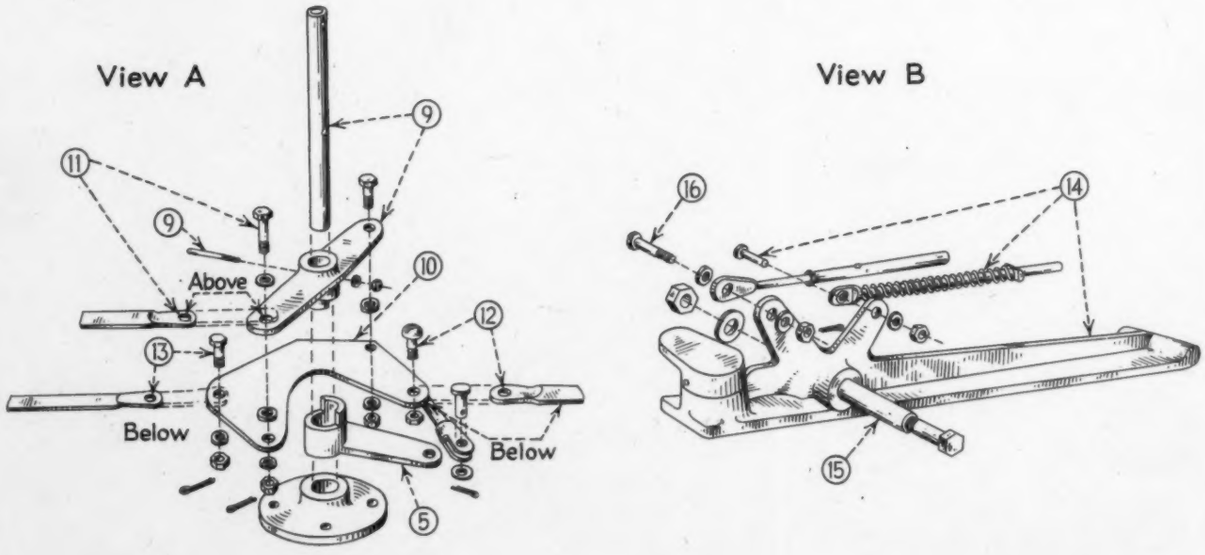
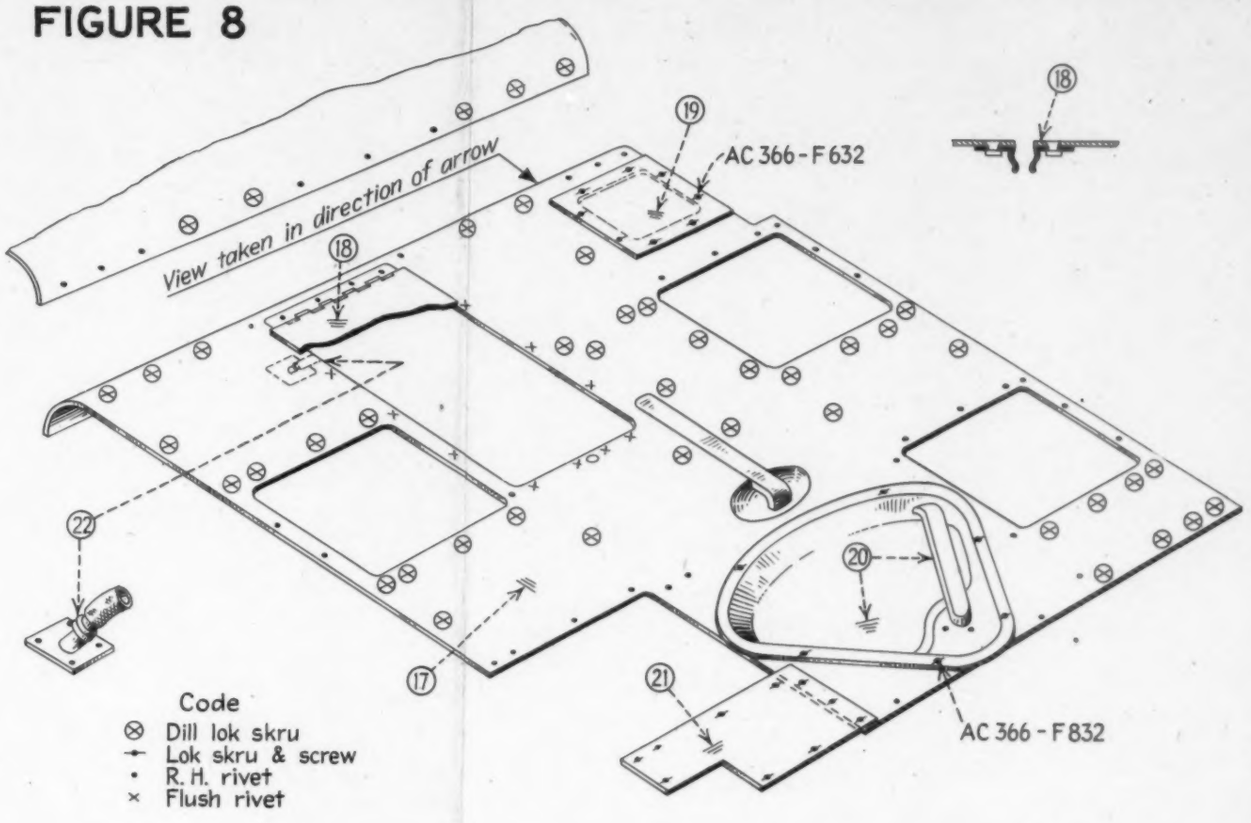


FIGURE 8



STATION E

Oper. No.		No. Req.
1. 2068529	Emergency Pull Handle	1
2. 2068543	Forward Cable Assembly	1
AN393-15	Pin (attach to pull handle)	1
AN960-10	Washer	1
AN380-2-2	Cotter	1
3. 4069032	Aft Cable Assembly	1
AN394-13	Pin (attach to pull handle)	1
AN960-10	Washer	1
AN380-2-2	Cotter	1
4. S1026614-4-024	Spacer	1
AN4-12A	Bolt	1
AC365-428	Nut	1
AN960-D416	Washer	2
5. 2068528	Arm (attached to 2068543)	1
AN393-13	Pin	1
AN960-10-032	Washer	1
AN380-2-2	Cotter	1
6. S12648-4L	Clip (forward cable assembly)	1
S1049017-8-7	Screw	1
AC365-832	Nut	1
7. S126480-4L	Clip (aft cable assembly)	2
S1049017-8-7	Screw	2
AC365-832	Nut	2
8. 1060902	Pin	1
AN394-13	Pin	1
AN960-10	Washer	1
AN980-2-2	Cotter	1
139081	Roller	1
1060903	Spring	1
S1049017-10-10	Screw	1
AC365-1032	Nut	1
AN960-10	Washer	2
9. 1069207	Shaft	1
NOTE: 1069207 with 2068454 and 2068438 are jig-drilled.		
2068454	Cam	1
S124604-10-9	Taper Pin	1
AN960-D6	Washer	1
AC365-D632	Nut	1
10. 5068858-76	C.M. Steel Plate	1
AN3-5A	Bolt	1
AN960-10-032	Washer	2
AC365-1032	Nut	1
11. 2069448	Rod Assembly	1
S1026614-3-006	Spacer	1
AN3-7	Bolt	1
AN960-10-032	Washer	2
AN960-10-064	Washer	1
AC320-3	Nut	1
AN380-2-2	Cotter	1
12. 2130164	Tube Assembly	1
S1026614-3-006	Spacer	1
S10296575-10-7	Screw	1
AN315-3R	Nut	1
NOTE: This part is spiked in four places, and the assembly is inserted into the frame with 2068528.		
13. 2130164	Tube Assembly	1
S1026614-3-006	Spacer	1
AN3-5	Bolt	1
AN960-10-064	Washer	1
AN320-3	Nut	1
AN380-2-2	Cotter	1
14. 4069058	Door Lock Handle	1
1059825	Rod	1
1060938	Spring	1
1059750	End	1

	S1026614-3-005	Spacer	1
	AN23-10A	Clevis Pin	1
	AN960-10-032	Washer	1
	AC364-1032	Nut	1
15.	S1026614-4-101	Spacer	1
	AN4-14A	Bolt	1
	AC365-428	Nut	1
	AN960-D416	Washer	1
16.	AN3-7	Bolt	1
	S1026614-3-008	Spacer	1
	AN960-10-064	Washer	1
	AN960-10-032	Washer	1
	AN320-3	Nut	1
	AN380-2-2	Cotter	1
17.	5068858-68	Top Cover Plate	1
	#6761	Dill Lok Skru	41
	#6762	Dill Lok Skru	4
	AC366-F632	Nut Plate (under -34 door and above 1060903 spring)	1
	AC366-F832	Nut Plate (around 4069098 well)	6
18.	4069128	Relief Tube Assembly	1
	183637	Clip	1
19.	5068858-34	Door	1
	#6760	Dill Lok Skru	6
	#6761	Dill Lok Skru	1
	S1027301-6-6	Screw	8
20.	4069098	Door Handle Well	1
	S1049017-8-6	Screw	6
	2068438	Handle	1
	S124604-10-9	Taper Pin	1
	AN960-D6	Washer	1
	AC365-D632	Nut	1
21.	5068858-58	Cover Plate	1
	#6760	Dill Lok Skru	7
	#6761	Dill Lok Skru	3
	S1027301-6-8	Screw	10
22.	5068858-60	Relief Tube	1
	33A4739	Horn	1
	5068858-74	Lock Wire	2

NOTE: Wrap each end of -60 with approx. 2 turns lock wire, add adhesive tape, and shellac.

INSPECTION NOTES

1. Inspect installation of emergency pull handle assembly.
2. Inspect all taper pin installations before installation of washers and nuts; and after for safety and tightness.
3. Inspect cable assembly for short radii causing excessive drag and condition, dents, loose clamps, poor swedge fittings, safety, etc.
4. Inspect complete installation against parts list for missing parts.
5. Inspect for operation, safety, and paint before installation of top cover plate.
6. Inspect top cover plate for fit, installation, trim, and condition.
7. Inspect Dill Lok Skrus for looseness and cracks.
8. Inspect for loose screws, installation of relief tube assembly, door handle well, cover plates, etc.
9. Inspect taper pin installation in door handle also clearance of handle in all positions.
10. Inspect complete job for safety and condition.

John R. Schwartz checks an isometric drawing of a bulkhead at Vega, as Glenn Showers installs a section

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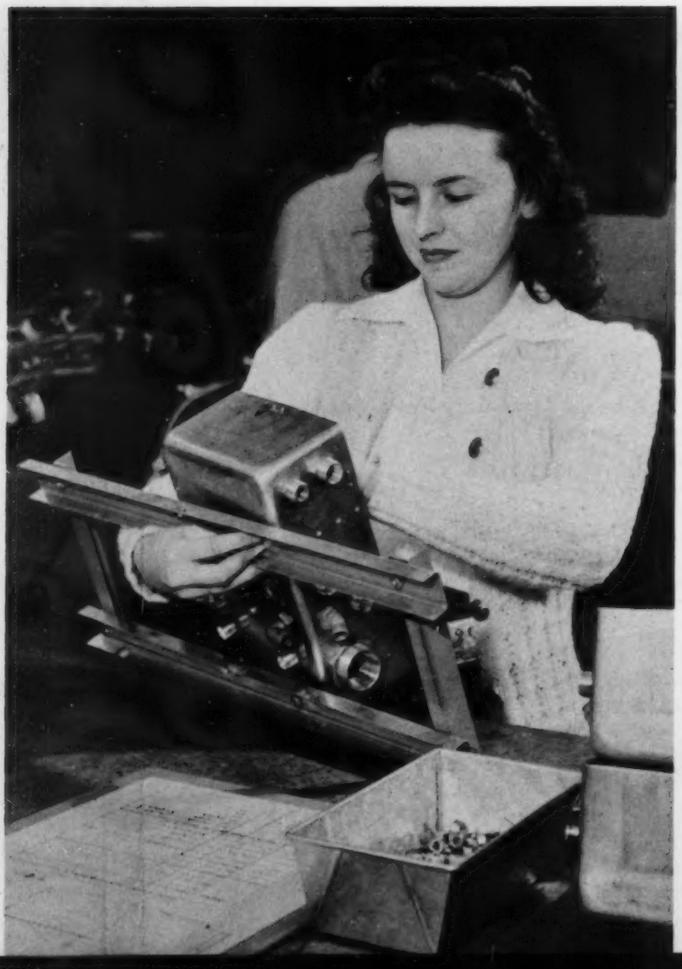
Above, Terrance L. Dolan and Paul A. Braun refer to a Vega production illustration in order to be sure a pulley unit is correctly installed. Below, left, Verita Van de Car of the electrical assembly department installs a support bracket of an engine junction box, with the aid of a production illustration chart. Right, Joycille Peterson, after one week in the plant, is pictured installing box and elbow fittings. Speed of assembly of parts like these has been tripled under the chart system used at Vega



Significant Labor Developments

Period surveyed: April 10 to May 10

TREND INDICATORS

No Conviction on Past Violations

EVIDENCE OF PAST VIOLATIONS of the Wage-Hour Act was held not admissible against an employer, since he can be tried only for the wrong he is specifically charged with. (Tidewater Optical Company, Inc. vs. Wittkamp.)

Circumstantial Evidence May Convict

The Circuit Court of Appeals ruled that the National Labor Relations Board was justified in relying on circumstantial evidence of discrimination. The fact that there was no direct evidence that the employer knew of the employee's union activities was held to be immaterial. (NLRB vs. Abbott Worsted Mills, Inc.)

Application of Wage-Hour Act Greatly Extended

The Wage-Hour Administrator ruled that the Act does extend to employees engaged in producing commodities which, although consumed within the state of production, *aid or facilitate the manufacture of the goods for interstate commerce.* This greatly broadened application of the Act brings under its coverage employees engaged in producing electric energy, steam, fuel, or water for use of railway terminals, radio broadcast stations, or manufacturers engaged in producing for interstate commerce.

Deductions From Wages Not Allowed

A series of deductions from employees' wages for rent, tools, purchases at company stores, and other items were disallowed by the Wage-Hour Division, since they reduced the employee's wages below the minimum required by the Act. The deductions included those for tools of the trade, water coolers installed in the plant, and fees charged for collecting interest and other debts from employees. Furthermore, deductions will be disallowed even though they are for permissible items, such as rent and electricity, where they exceed the reasonable cost. To the extent of such excess, the deductions are illegal when bringing cash wages below the legal minimum.

WPB Rules on Wage Increase Applications

In the first decision to be handed down since the President formulated his wage stabilization program, WPB ruled that 14 of the highest craft wage rates remain unchanged while 10 lower craft wage rates be increased. The decision was made by a board of arbitration, selected by the Board of Review of WPB's labor production division, and was under the building trades stabilization agreement, final and binding.

Under the decision painters who received $1.37½ an hour and asked for $1.50 were awarded $1.50. Bricklayers who used to get $1.60 an hour were awarded $1.67½. Hoisting and portable engineers get $1.12½ under the award against $1 earned at present.

Penalties for Wage-Hour Violations

Where a company bought pulpwood from numerous small producers it must have known that the goods were "hot," produced in violation of the Wage-Hour Act and, therefore, was held criminally liable. (Southern Advance Bag & Paper Company.)

For violating a consent judgment entered under the Wage-Hour Law, four officers of the offending company were sentenced to prison terms; two to serve three months and the other two received suspended sentences. (Bushwick Clothing Company of Brooklyn.)

Wage-Hour Act Superseded

A Federal District Court ruled that the Eight-Hour Law supersedes the Wage-Hour Act and, therefore, a construction company subject to the former need not comply with the minimum wage and overtime pay requirements of the Wage-Hour Act. The Court based its ruling on the fact that the Eight-Hour statute is the later law (i.e., it was amended in 1940 and the Wage-Hour Law was enacted in 1938) and supersedes the Fair Labor Standards Act on wage-hour questions. (Fleming vs. Patton-Tully Transportation Company.)

Exemptions Under Public Contracts

The Secretary of Labor has issued an exemption from the Public Contracts Act to permit employment of women between the ages of 16 and 18 on government contracts in 15 industries. The textile and wearing apparel and allied products industries are not covered by the exemption.

The exemption established a minimum employment age of 16 years for both men and women in a large percentage of plants engaged in government contract production.

WAR LABOR BOARD

WLB Refuses Jurisdiction

The Board returned a certification to the Secretary of Labor where it found that the dispute over the union's demands for a wage increase and the lessening of area wage differentials have not been submitted to the arbitration machinery which was available under an existing contract. (Gaffney Manufacturing Company.)

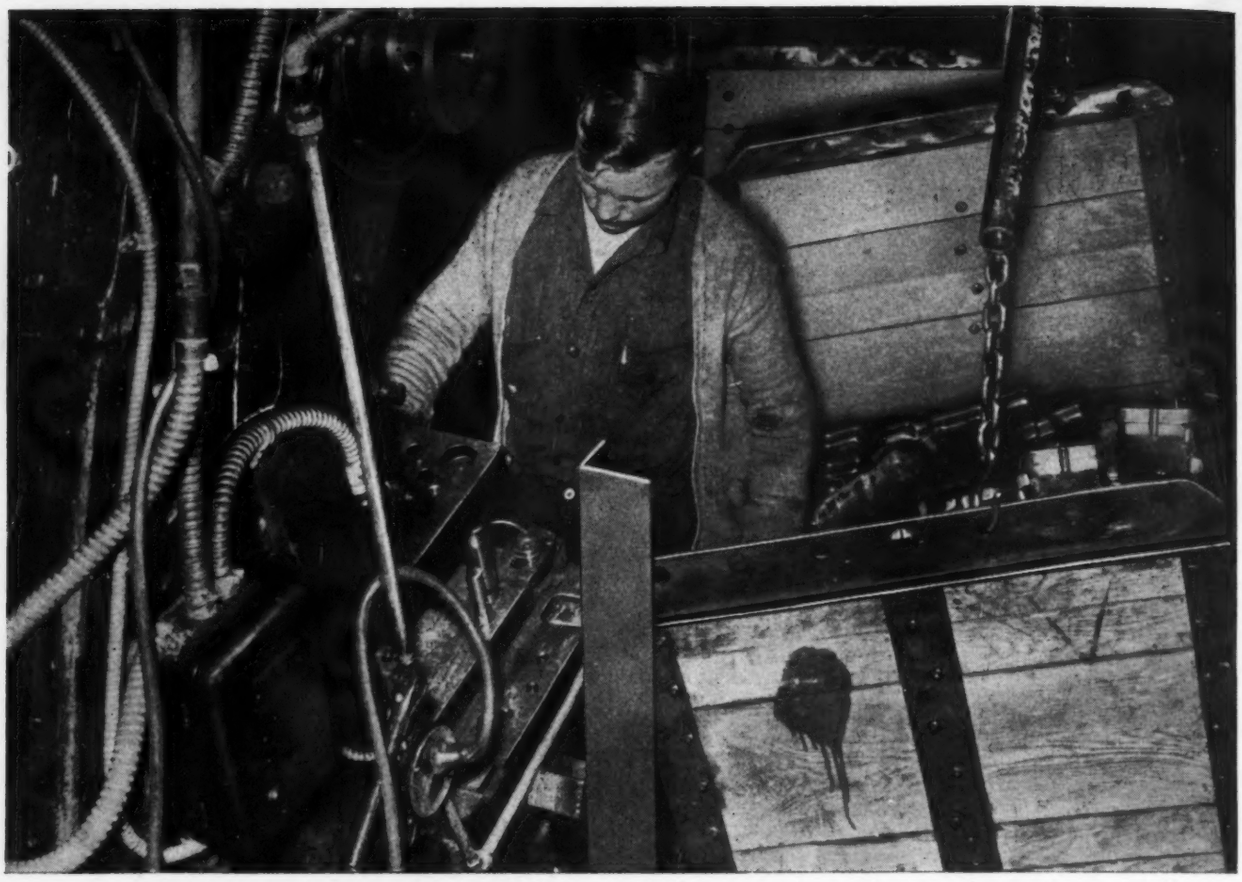
**Wage Increase Granted*

In International Harvester Company case the Board announced its wage policy, i.e., to reduce wage differentials. By this means it would bring the lower scales to a minimum standard of health and decency by collective bargaining and a controlled use of the cost of living index. Higher wages, under the policy, would not be increased in proportion to increases in living costs. Premium pay for work on weekends and holidays, when not including hours in excess of 40 per week, would be abolished but only for operations on war work which the employer had placed on a 168-hour basis. This mode of deciding the question places a penalty on failure of the employer to expand production to the maximum.

In Oliver Farm Equipment Company, wage increase was ordered where the company's wage schedules were lower than those for the industry, although wages paid by the company have been increased at a greater rate

(Continued on page 208)

* In this and the following classification items marked with an asterisk also are considered to be trend indicators.



Yoke is attached off-center, allowing the box to tilt and forcing parts to slide toward the operator

Better Handling Broke a Bottleneck

As they come from the presses, parts ride portable elevators right into the box that carries them to the next operation. No more careful positioning of small tote pans behind presses, no more lifting, no more spilled parts to be picked up

W. J. PEARSE, Time Study Department, King-Seeley Corporation, Ann Arbor, Mich.

THIRTY PERCENT GREATER VOLUME had to be obtained from the ten large presses in our pressroom. Addition of presses and floor space was not advisable—the solution had to be sought in other ways. Sequential flow with interconnecting conveyors was out of the question, because our work is of the job shop type, and the volume of any one run is not enough to establish production lines.

Some time ago, to avoid the usual reaching down into deep boxes, we replaced the large metal boxes commonly used in press shops with small tote pans. A skid load consisted of 32 of these pans. A full pan had to be placed in position at the press and an empty one for complete parts behind the press. Walking behind the press to place and remove the tote pans, and stooping to pick up spilled parts, required about 6 minutes per 100 parts. Also, the large number of these pans kicking around the department took up a great deal of valuable floor space.

The problem simmered down to making an analysis of lost time both at the front and at the back of the press. Observation indicated that too much time was being spent behind the press. Here the solution was to provide an elevating mechanism to take completed parts and deposit them automatically into a box, and thus

restrict operator activities to the front of the press. It will be recognized at once that this method has been in use in many press shops for some time—we merely adopted a tested method.

It was equally obvious that some plan was needed at the front of the press to eliminate the frequent shifting of pans required to handle the production. Large boxes resting on skids, and handled by lift trucks, would involve too much fatiguing trunk movement on the part of the operators. An elevating device had to be developed.

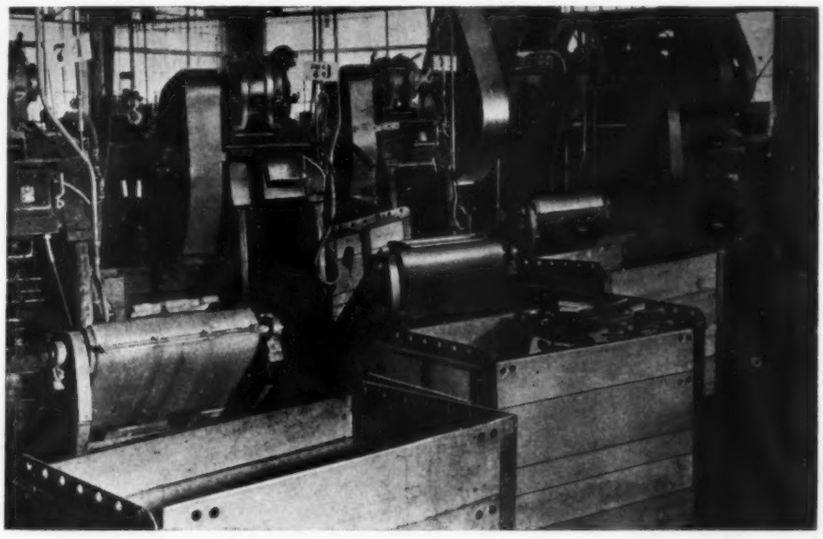
It was planned to use boxes of the same size, 30x36x48 inches, at front and rear of each large press. A careful analysis, however, was necessary to determine the advisability of buying the necessary new equipment.

Each part going through the ten large presses was checked, and the computation of savings divided between the front and the rear of the press—comparing the equipment just mentioned with the small pan method.

Before describing the mechanics of the new method in more detail, it may be well to indicate one aspect of the operation at the front of the press which showed a smaller saving than we had anticipated.

The small tote pans were positioned on a special platform close to the bolster plate of the press; thus "transport empty" and "transport loaded" were short. Also, the parts always were ranked in the same position in the box—grasp was thus facilitated, and pre-positioning, or orientation, of the part to fit into the die was at a minimum. With the large boxes the parts were dumped in indiscriminately by the elevator at the rear of the press. The new method involved more orientation than the old, and therefore more time. But the increase in time at this point was not important enough to nullify the advantages.

To provide for the elevating mechanism at the front of the press, an I-beam to be serviced by hoists was strung from the roof trusses over the



Portable elevators placed behind presses drop parts into boxes, all ready for the next operation. Fingerholes in the side boards make it easy to remove the boards one by one as the boxes are emptied

Time studies of the existing method carried the time increments of the operator for activities at the front of the press as well as at the back; the computation, then, consisted in calculating the importance in productive labor of the eliminated increments. Analysis of each time study for each part going over the large presses gave the total productive hours saved. This saving could then be compared with the bid price of the new equipment to indicate the advisability of the investment.

presses. A half-ton stationery hoist operated by a pushbutton was suspended from this beam. In each case the hoist was placed so that the box which it elevated would be at the operator's left, and immediately adjacent to the press bolster plate. A metal strip with punched holes is attached at each end of the metal framework of the box. A yoke connects the hoist hook with two short chains attached to this strip.

Since these boxes are 30x36x48 inches, it would be necessary for the operator to reach over a wide area to secure a part, unless some arrangement were made to cause the parts to flow, or slide, to one section of the box. Therefore the eye-hook on the yoke is placed off-center so that, as the box is elevated, the parts flow by gravity to the spot most convenient for grasp by the left hand. The sides of the boxes are removable, board by board, as the box is elevated. This eliminates a cost element so frequent in presswork—barriers to the motion path.

In the time study of the new method, an allowance had to be made for rolling the large box into position, attaching it to the hoist, and elevating it as the parts are progressively removed, but this is much less than the allowance for handling the 33 tote pans which each large box replaced. In fact, the saving at this point was approximately 12 minutes per box.

The net result of the new method was that the savings covered the investment in hoists, elevators, and boxes in about four months. One hundred large boxes were required for the whole shop, a half-ton hoist and a power-driven elevator were required for each of the ten presses. Some floor space was saved, and the press capacity, the shortage of which started the study in the first place, was increased by one-third, because handling time behind the press was eliminated and handling time in front of the press was reduced. The saved time of the operator could thus be devoted to operating the press.

Workers' Reaction

Two points should be mentioned. The first is the reaction of the workers to the new method. They reacted unfavorably at first because the rate was reduced. There were things they no longer had to do. Within a month, however, they began to admit that the job was much less fatiguing than before, because they no longer had to go behind the press, bend over to pick up spilled parts, and lift the tote pans. These things they did not like to do, and the new method eliminated a grievance. The large boxes were supported on casters and could be rolled into position.

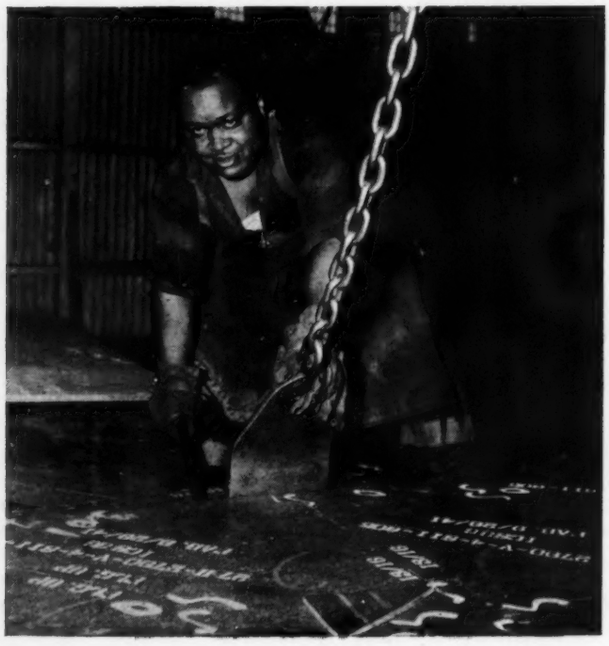
The second point is the character of parts that it is feasible to handle by elevators at the rear of the press. Our steel parts can be dropped from the end of the elevators into the large boxes without danger of dents or scratches. With softer metal, such as brass, this method would need to be modified to protect the surfaces.

Where Negroes Are Filling Jobs in

A careful inspector, this negro in a government arsenal where thousands of shells for the Army's new guns are coming down the production lines

One of thousands of skilled workers in a shipbuilding yard, where many complicated machining operations are necessary to produce ships

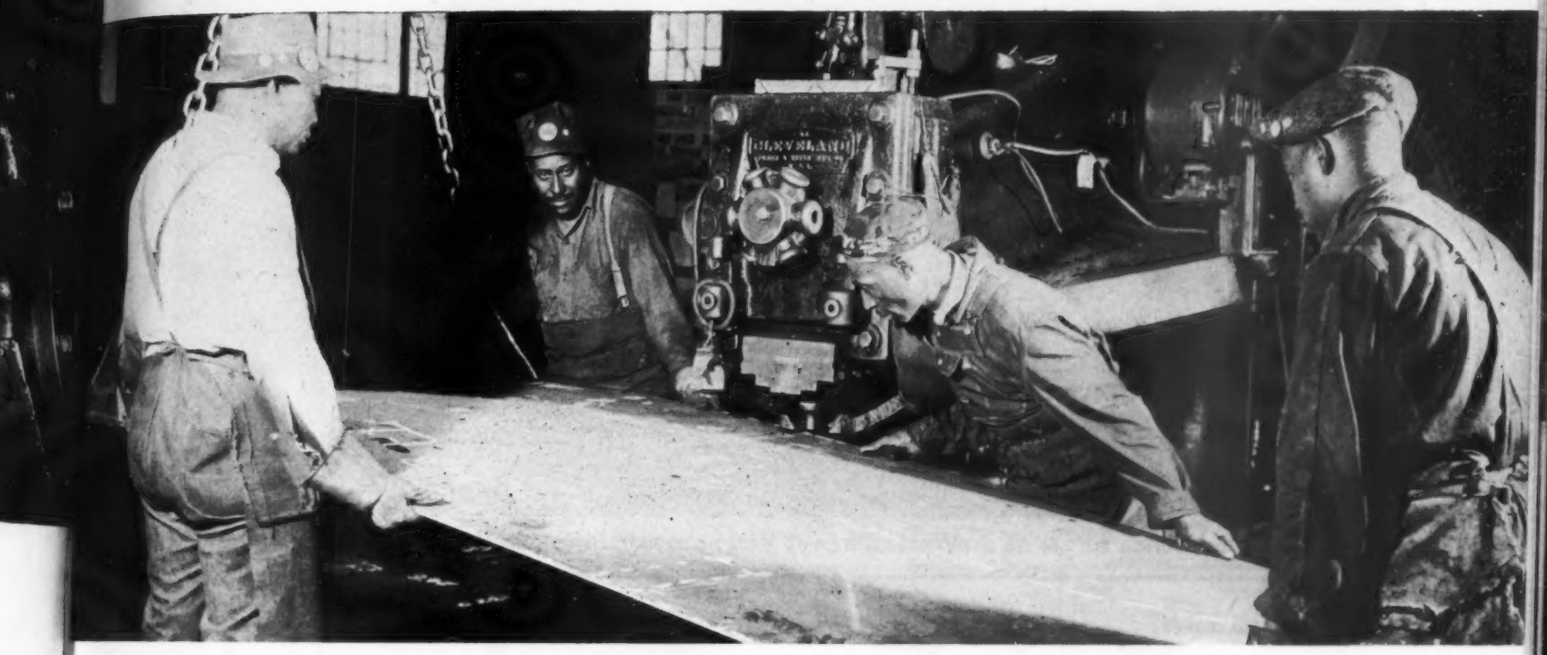
Negro worker in plate-bending shop, where steel plates are bent to fit the sidings of warcraft. Operation demands a high degree of skill



Negro employees do their part in the government arsenal that is turning out cartridge cases. Here, cases are washed between drawing operations

Job in War Production Plants

Not just laborers, these negroes on war work in war plants. They are holding down jobs that call for the exercise of many of the higher skills associated with war production. For hundreds of plants that are feeling the pinch of labor scarcity, the negro workers of this country offer a virtually untapped source of supply



Doing their part to supply the ships that will eventually win the war. Above, four men guide a steel sheet through a punch press. Plate will then go to the steel plate section, thence by overhead crane to the shipbuilding ways. Below, two skillful negro workers punch holes in the frame of a ship

Photographs by courtesy of the Office of Emergency Management

Figure 1. Circular bench serves as a materials mover and subassembly storage space between operations

New Assembly Layout—

Motion study principles applied to bench assembly showed the way to two new bench designs. They eliminate reaching, reduce walking, speed production, save space

WALTER J. TILLMAN, The DeVilbiss Company, Toledo

CONGESTED CONDITIONS caused by increased demand called for a change in assembly methods. This change had to be made without extending the floor space devoted to assembly, in such a way as to avoid damage to expensive parts and products, and, as a byproduct, to reduce costs to a competitive level. All three objectives were attained.

Assembly operations in our plant are confined to small paint-spray guns and to perfume and medicinal atomizers of many sizes and types. The nickel, chrome, or gold finish requires careful handling to avoid scratching, and, because expensive cut glass is used in many of the assemblies, breakage is also a consideration. From 30 to 40 different perfume atomizers are produced, and a somewhat smaller variety of medicinal atomizers. Assembly of the company's larger industrial products—spray-painting equipment, exhaust systems, air compressors —is, of course, handled in an entirely different manner.

The old assembly plan consisted of a series of rectangular benches 48 inches wide, with operators on both sides. Bench tops were used for assembly, for sliding partly finished products from one operator to the next, and as resting places for material banks.

This plan had definite and obvious disadvantages. Congestion was the most apparent. To provide for increased production, more benches would have to be crowded into the same space. Parts supply to the benches and the removal of assembled products would become even more difficult. As it was, these services interrupted productive operators, because

Figure 2. Materials are delivered from the outside curve of horseshoe bench, and workers are not disturbed

20 Percent More Output

they had to stand aside when new supplies were brought in or taken away by the stockhandlers. Also, delicate and expensive products were frequently scratched. Trays were used to move partially assembled products between operators; it was only natural that these trays would be piled too high, with consequent damage to finish. Moreover, the need for handling care by the operators resulted in excessive handling time.

Not quite so obvious were the excessive walking and reaching entailed. It is impossible to balance the operations on these products so that each operator has the same time to do his or her operation—one may require five seconds, for example, while another takes eight per assembly. This means that there must be considerable shifting about—walking from one assembly position to another, which, with the

(*Continued on page 216*)

Figure 3. Slide feed bins or inclined tote boxes enable operators to use a less fatiguing arm movement when getting parts for assembling

The Woman in the Shop

Trouble? Some. But the major problems are soon found to be minor. Here's how they were solved by a concern that has hundreds of women doing men's jobs

GEORGE S. HASTINGS, Manager, Industrial Relations, Inland Div., Vultee Aircraft, Inc.

"I HONESTLY DON'T BELIEVE any of us expected them to last the day." So says Les Reed, the foreman of the department where the first two Vultee women started to work. "The office had talked me into taking them on, and I agreed with the leadmen that we'd give them a fair trial. And we meant 'fair trial'—no special favors, no babying.

"These two girls came in. I handed them each a bucking bar, teamed them with a couple of good guys, and told them to get busy. When I walked by a couple of hours later I expected to see a couple of tired girls. I was pretty surprised to find the girls had the guns, and the boys bucking for them. Next day I teamed the girls together, and they're still at it, doing as well as anyone could ask."

The original decision to bring women into the plant was not met with cheers by anyone. The main problem was the resentment of old workers and supervisors when they saw untrained girls coming in to take over jobs. The immediate suspicion was that girls would lower the wage rate and be used to replace skilled men who were making high hourly wages. There was also a certain amount of resentment caused by the suspicion that girls would be given favored treatment. Foremen and supervisors felt that girls might be a disturbing influence.

The solution to all this has proved to be a matter of education. Girls are paid on the same basis as men. They are not being brought in here to replace highly paid men, but rather to replace men who are drafted into the armed forces. In many cases men have been moved upwards to more responsible positions when girls have been brought in on the unskilled jobs. The girls are given exactly the same treatment as the men. They are required to report on time; they must observe the same rules of conduct; warning slips are issued to them for offenses; and as much is expected from them as from men of comparable experience. Once the men understood these facts the girls caused little disturbance.

The second big problem was in deciding what type of job to give to women. At first it was thought that there were certain types of work that were "feminine." Experience has shown, however, that there are few jobs a girl cannot handle. We have found that girls lack mechanical experience but not mechanical ability. Although the foreman does have to explain what he means by a wrench, drill, or rivet gun, and explain carefully each step of a job, girls seem to be able to pick the work up, particularly repetitive work, just as easily as men.

Next in importance is the problem of training the girls, who, as a group, are unskilled, with no mechanical or shop experience. Government and private training schools are located in this area, but in most cases we found that they serve only to give the barest preliminary training in shop terms and customs. We have a school at the factory in which some girls are trained in riveting, sheet-metal work, drilling and countersinking rivet holes, and other skills. Mainly, however, training is done on the job by the foreman and leadmen, and the girls are actually learning by doing the work.

Standard Uniforms

The fourth major problem was just about what you would expect. Naturally, the presence of girls caused a certain amount of excitement among the men employees, and for a while last fall a sort of unannounced contest seemed to be in progress as to which girl could wear the flashiest or most revealing clothes to work. This was very neatly solved by putting the girls into a standard factory uniform, designed by a committee of girls chosen by themselves. The uniform decided upon is a two-piece slack suit which, although neat, is unaccentuating. During the summer a blue shirt of lighter-weight material is substituted for the heavy winter garment. The effect of this seems to have been to put all the girls in the same category, and we find men and women working with little consciousness of each other.

Scrupulous adherence to the rule of no special favors for women employees has gone a long way towards allaying the natural suspicion and resentment of some of the more experienced workers

In almost every production department at Vultee—power plant assembly is shown above—girls are doing a thoroughly acceptable job

Attendance was one of the minor problems which we expected to face. Experience has shown, however, that the girls are just about as regular in attendance as men, and from a health point of view they seem to be able to hold their own. In this same line the number of visits by girls to our first aid room is more or less in proportion to the number of girls in the shop. Once they had been fitted with hair nets and learned to leave rings, necklaces, and bracelets at home, their accident rate was no higher than the rate for the entire factory.

Girls as a whole seem to be more easily satisfied with their jobs than men. There is much less turnover among women employees, and I believe that to date we have had no case where a girl left this plant to take a job with another aircraft company.

In some spots the girls have proved invaluable. There's one little girl, for instance, who probably wouldn't weigh 95 pounds soaking wet. She couldn't even pick up one of the big rivet guns. But give her an armful of blue prints and an air drill and let her crawl inside one of the Vengeance monocoque sections and you'll get more work accomplished in one day than ten husky men could do in a week.

As an example of the way in which the girls have been spreading out through the whole plant, here's a partial list of the jobs they are doing: Machine shop subassembly—set up jigs, drilling, riveting, burnishing, and pressing in bearings; major assembly—landing gears, rudder pedals, drill presses, clerk, and stockroom; fuselage assembly—instrument installation, main electrical panels, pilot armor plate, rear stick assembly, wobble pump, rear and front rudder pedal, rear instrument panel, firewall hydraulics, bomb control panel. In the machine shop they operate small hand turret lathes, small hand screw machines, small milling machines, and multiple spindle drill presses.

A final word. If enjoyment of work helps to make a good worker—and I think it is pretty well proved that it does—then the girls have plenty to offer industry. As one girl said the other day:

"I'm really a little surprised to find myself out here bucking rivets, but I wouldn't trade jobs with anyone. You see, I feel as if I am really doing something to help in this war. My brother was drafted last week, so I sort of have a personal interest in every airplane that goes out of this shop. Maybe a plane that I help to build will be fighting on the same front that he is."

Girls are more likely to lack mechanical experience than mechanical ability. Sometimes this is a benefit because they have nothing to "unlearn." Once they know how, they can handle almost any job

Do Workers Want to Manage?

Not when they understand the problems of management—problems that all too few managements have taken the trouble to explain. Now is the time to do it

WHITING WILLIAMS, Consulting Editor, *Factory*

THE HEAD OF A BIG RUBBER WORKS in North Italy was telling me about the time in the early 'twenties when the communists got control of city governments and local industries:

"Because these Red bosses had no technical training, the moment some complicated piece of machinery broke down, it just stayed down. That big one over there happened to keep going. So when we managers regained control, we found on hand enough rubber heels of that machine's particular type and size to supply the entire world for fifteen years.

"When, shortly, the Red committee ran out of cash, one bright member recalled seeing on the company's statement—'Surplus 15,000,000 lire.' They figured that this life-saving sum should be in the office safe. When they broke the safe open and found practically no money, they all agreed that 'This proves what we've always contended: Our managers were nothing but a pack of liars!'

"As you doubtless know, it was the Bolsheviks' failure to keep either industry or government going here in industrial Italy that made Mussolini look like the savior of his country when his black-shirted followers marched on Rome."

Ignorance and Distrust

Italy's experience, of course, hardly suffices to prove that American wage earners are incapable of management or that their sharing of control here would lead to communism or fascism. But it is in line with a certain conviction gained during many years of talking with the rank-and-file worker here and abroad—the conviction, namely, of his astonishing ignorance of the nature of management and management problems, and of the depressing way this ignorance appears so often to justify to him his distrust of management's motives.

An amazing number of American workers have no idea of their general manager's or even of their own foreman's name, and know their gang-boss only as Mike or Pete. A surprising number, believe it or not, do not know the name of the company they work for. Even after years on its payroll, the closest they can come is that they work "at the steel plant over on the West Side." No wonder that a certain employment manager was recently bedeviled by newly hired laborers who quit one by one after only a few hours, all because a practical joker had slipped them the word that every time they heard the factory call signal it meant that one more employee had been accidentally killed.

This lack of understanding is far from harmless. For many years it has here, as in Italy and elsewhere, been utilized by the enemies of democratic free enterprise. Regularly these enemies ascribe no limit whatsoever either to the power of money itself or to the malicious purpose of its every owner.

"Why has this depression hung on so long?" So ran more than a few pre-war discussions. " 'S' plain as the nose on your face. Those Big Wall Street boys haven't yet got hold of all the other folks' money they think they can get. Why, if them plutocrats was to decide tonight that they couldn't get no more, they'd have a meeting tomorrow morning—and people'd be back at work in no time a-tall!"

In the open-air talk-fests endlessly maintained in such squares as Chicago's Bughouse, Los Angeles's Pershing, or New York's Union, it is always assumed that if John Smith loses money it simply has to mean that somewhere, somehow, some evil-purposed John Brown has put in his pocket or his bank account exactly the same amount. And any doubter is sure to be put in his place by the instant query:

"Well, where the hell did the money go to, then? Answer me that."

Most disheartening, also, is the way the soapbox expounders of *isms*, especially of communism, make their evil gospel appear authoritative by clothing it in hifalutin language and by hanging it on specific, personal "devils." Unfortunately, after their long-winded jargon of "tactic," "dialectic," "Bourgeoisie," "Rockefeller," "Morgan," and such like, it has to be reported that a discouraging number of listeners will be heard approving with their "Damned smart, that guy. Knows what he's talkin' about."

Suspect All Managers

To be sure, few of his audience can claim this last for themselves. But most of them can carry away his message of complete suspicion of all industrial and financial managers. I felt like shaking hands with one questioner at a public "catechism on communism" held for negroes in a Chicago park. "Bushwacker" was the nearest he could come to "bourgeoisie," so he was evidently shaky about the speaker's economic gospel. But he did have the courage to question its bitterness with "One thing Ah don't understand. Why do us communists have to be so hard on God?

This depressing and dangerous lack of both understanding and confidence is, of course, to be attributed less to our wage earners than to our general body politic and social. It is to be remembered that, during the boom of the 'twenties, the educational and cultural hinterlands of both our nation and our continent had to be ransacked for the manning of our factories. And even before this, in a certain aristocratic suburb of Boston, an honorable and elderly citizen is said to have lost an election to the school board because of the statement that he was a "sexagenarian."

Altogether those who study the

New Address?

For your convenience, and for prompt service, use the change-of-address coupon on page 278

Labor-management committee displays the flag that symbolizes "Quicker for Victory" drive at Westinghouse Cleveland Works. This type of committee, recommended by WPB and flourishing today in hundreds of plants, serves to re-focus attention on the old, old question: Do workers want to manage?

rank-and-file worker-citizen and keep in contact with him are sure to believe the following:

That he represents a measure of "economic illiteracy" which should give serious concern to all believers in our American way of life. This measure follows from the fact that he depends for his education less on schools and books than on his personal, day-by-day experience and first-hand observation.

That this dependence gives him a highly valuable degree of expertness in the daily handling of his machine.

That he has extremely little desire to manage the plant because his dependence on his experience makes him quite conscious of its limitations.

But also that, if he is intelligently helped gradually to widen his experience, he can be expected to develop a satisfactory measure of personal understanding and confidence in management, along with an equally satisfactory measure of skill and responsibility in its sharing.

The above cannot be said of all his leaders. Nevertheless, it is worth noting that, in line with the above, the AFL unions have long been famous for following the Sam Gompers tradition and generally steering away from claiming any great share in bossing. Worth noting, also, is the number of pages in United Mine Workers contracts which contain the statement that they "intend no intrusion on the rights of management as heretofore practiced and understood," or that "the management of the mine, the direction of the working force, and the right to hire and discharge are vested exclusively in the operator, and the United Mine Workers shall not abridge these rights." Noteworthy, also, is the way the garment organizations led by Hillman and Dubinsky have often helped employers out of trouble, not by demanding authority as a union right, but by paying for and making available the services of professional managerial experts.

Under the circumstances, it is hardly strange if many executives have questioned the sincerity of the demand for management-sharing lately made by leaders of those few unions that are among the newest and least experienced, as also among those that in times past were known for their open or covert adherence to the communist party line. Considering the fact that these leaders base their demand not on individual fitness but on class and political prerogative, nobody can be blamed for wondering whether they are not utilizing the war emergency less for increasing total output than for enlarging union prestige, not so much for all-out war effectiveness as for sovietizing American industry. As a matter of fact, their proposal would seem to resemble the set-up in fascist Italy.

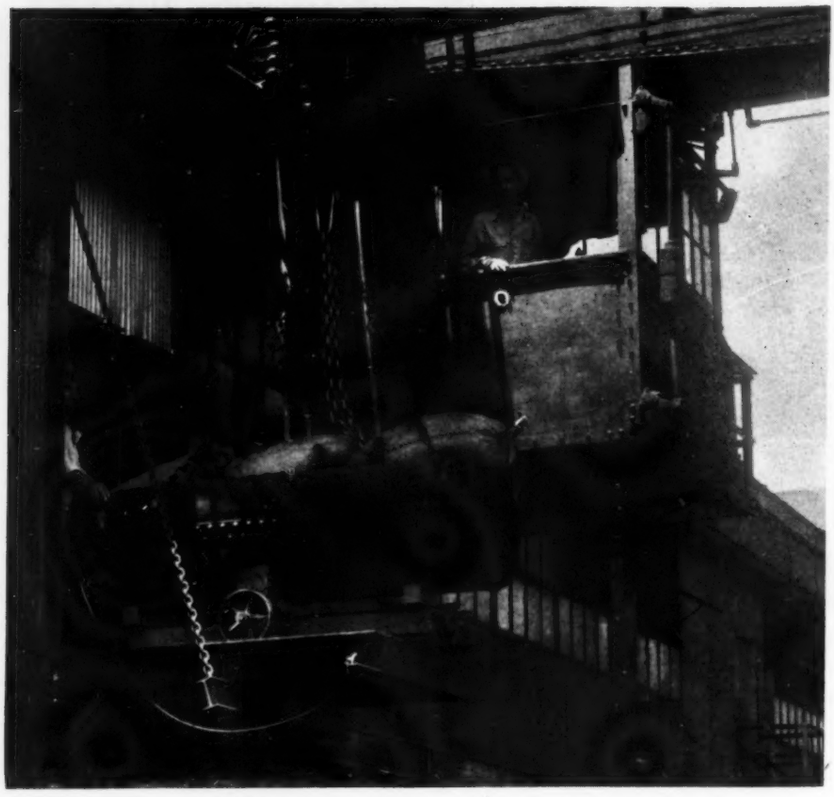
Moscow Learned

It must be said, however, that if such sinister purpose exists it indicates surprising ignorance. For Moscow learned by experience that it was footless to give the plant manager responsibility for efficient production and then make him share authority with a local politico and a worker-

(*Continued on page* 220)

MANAGEMENT SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary management accomplishments. Accepted articles will be paid for



Loaded pans are hoisted from unloading dock to platform, then to storage

•

Not secret weapons but magnetos for fighting-plane engines are under those upside-down paper bags. Delicate instruments, they need protection against dust as they ride the assembly line in a midwest General Electric plant

Drawbridge Platform Saves Handling Costs

E. H. TRICK, San Antonio, Texas

Because of the distant and inconvenient location of our second-floor foundry supply room in relation to our railroad siding the matter of unloading and storing car lots of supplies was bothersome and expensive. The supplies had to pass through core room and foundry, thus necessitating the use of the handling facilities of both departments. In addition, the work had to be done at night to avoid interference with work in progress.

A 10-ton traveling crane covers the area alongside the building from the railroad siding to the opposite side of the property. We decided to use this crane for transportation of the supplies from car to storeroom. Our solution transformed a troublesome and expensive job into an easy one, with a large reduction in cost.

A doorway of ample size was cut in the wall of the building looking over the crane area. This opening was fitted with a platform built drawbridge style. Made of steel, it is hinged to the concrete floor on its inner side, and is supported by a beam under the midsection. The beam, in turn, is fastened to heavy chains equipped with turnbuckles and secured to the under side of the overhead beam supporting the runway of the crane.

This platform is lowered and raised by a cable operated by a small winch fastened to the wall inside the building. When not in use it completely covers the opening in the wall. It has a steel plate floor on which are secured channel tracks to receive a low-wheeled truck carrying a heavy steel pan. Stops at the ends of the tracks permit the truck to be pushed out onto the platform.

Two pans are set down at car door level and loaded with foundry supplies. The crane man lifts and transports the loaded pan up to the truck waiting on the platform. When it has been emptied in the storeroom he brings it down again and takes up the other loaded one. This operation requires only a few minutes' time as the car is only a hundred feet away. The remainder of the time he continues with his usual duties of servicing the structural steel shop and the reinforcing steel fabricating shop, loading six-wheelers, and so forth.

The element of safety was carefully considered. The pan is made so that the operator at the platform can disengage the crane hook from the pan chains without stepping out on the platform.

Triple Protection Keeps Dust From Eyes

SOURCE—Reliance Electric & Engineering Company, Cleveland

The operator grinding a motor brush holder has been provided with triple protection. In addition to wearing safety goggles and having a glass shield interposed between his face and the grinding wheel, a special inclosure has been applied to the latter.

Constructed of light, sheet-metal sections bolted together, this hood makes it possible to collect the fine bronze and brass dust thrown from the periphery of the wheel during grinding operations.

A fan, driven by a 1-hp. motor, sucks the dust through a short length of hose into a fabric bag located in the base of the grinder stand.

Note also the light attached to one side of the glass shield and the switch for it flush-mounted in the top of the shield frame directly in front of the operator. This accessibility makes for greater use of the light and promotes not only safety but better work.

•

Microfilms offer an increasingly popular method of setting up permanent record systems. Records ranging all the way from small cards to large drawings are photographed in moving picture film. Saves paper. Saves space. Eliminates filing cabinets.

•

Scrap Drive Uncovered Tons of Steel and Paper

SOURCE — Lyon Metal Products, Inc., Aurora, Ill.

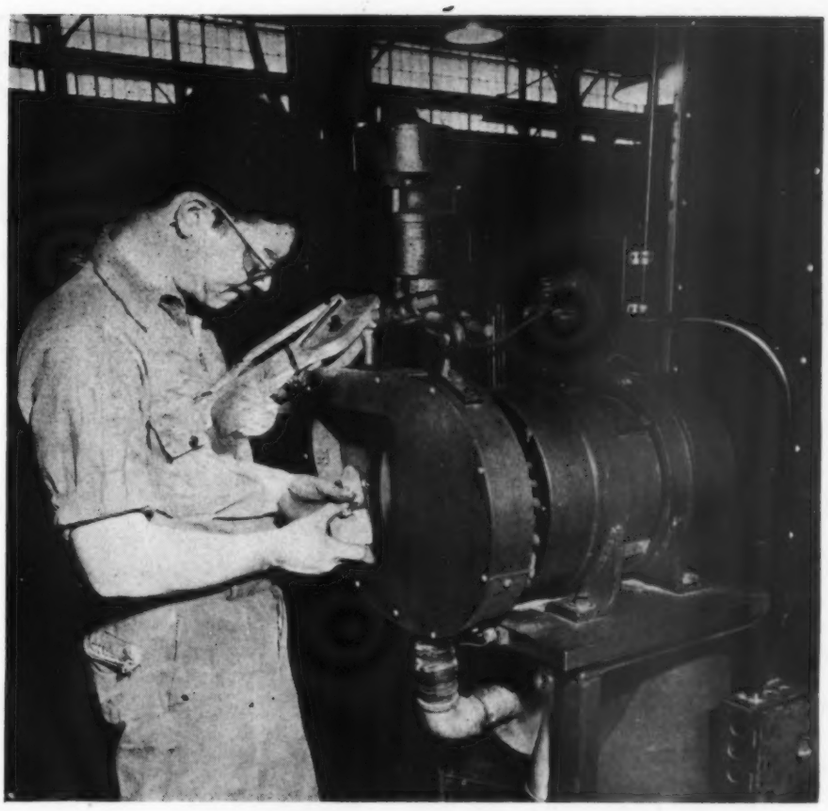
When 20 tons of scrap steel and over 4 tons of waste paper were gathered up during our "get in the scrap for victory" drive, we certainly were surprised. We have always been proud of the housekeeping job done in our plants and so were not too expectant or enthusiastic when the government suggested a drive to collect all scrap lying around. We just didn't expect to find much.

Because our campaign was so successful, we put into effect the following program in addition to routine checking against destroying or burning any materials that are salvageable.

In the factories

1. Periodic checking of plants, yards, drawers, racks, etc., returning all usable material to the stockroom.

2. Collection of obsolete production equipment for sale as scrap.



Safety goggles, glass shield, and a special hood for the grinding wheel afford the operator triple protection against bronze and brass dust

3. Collection of obsolete dies that cannot be reworked for sale as scrap.

4. Continuous effort to prevent spoilage by machine operators.

In the offices

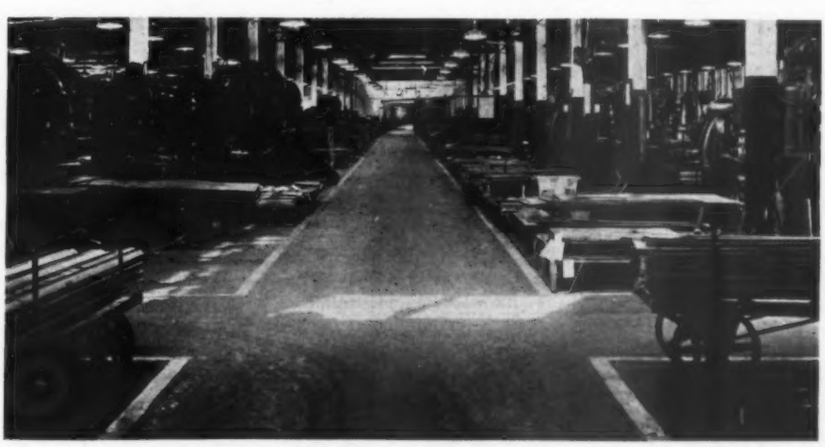
1. Analysis of every form and record for elimination wherever possible.

2. Establishment of and adherence to a time schedule for retention of records.

3. Elimination of unnecessary carbon copies of letters, forms, and reports. Routing of file copies to all interested persons.

4. Disposition of type, engravings, electrotypes, and rules in standing forms as soon as they are out of date.

Some of the obsolete equipment that turned up included odd-sized pieces that could no longer be used because of curtailments. The balance consisted of pieces gathered from corners and out-of-the-way places where no one had bothered to look before the war. The 8430 pounds of waste paper included old advertising material, records, correspondence, office forms, and other paper that could be re-used.



One would not expect to find any steel scrap in a plant this well kept. Yet, 20 tons of it turned up in odd corners and as obsolete equipment

Carter Products, Incorporated

VI—What Can Cost Records Do for Management?

Answer is "almost nothing" if they're too complicated or too late. Cost troubles at the make-believe Carter Products company are solved by a system that lets management know what's what every day. Sixth and last installment of a series

JOHN H. HILL, Industrial Engineer, Bundy Tubing Company, Detroit

ONE DAY Al Peasely, my boss in methods and time study at Carter Products, Incorporated, brought me a bulky bunch of cost reports from Sam Holland, superintendent.

"Sam wants us to go over these cost figures and to find out what they mean," said Al. "He is pretty burned up about the jobs that are in the red. I can't tell whether he is mad at the factory for having caused the figures, or mad at the cost department for telling him about them. See what you can make out of them."

So I started in. Three days later, I had worked to the bottom of a 16-page report which, according to the factory, was the monthly magazine of the cost department, and which was sent also to the Old Man, Sam Holland's father-in-law.

I gave Al a summary of what was involved.

"Let's go in and see Sam," he said.

So we went in, and I started telling Sam what I had found out. It was quite a story.

"To get to the bottom of this report," I began, "I had to look up the reports for the last two preceding months and make comparisons.

"There was a net upturn in costs of around $3000 for the period. Most of this was in the press department. I consulted Kirk Lansing, Jim Racine's assistant, about the reason and discovered that overhead in this department has been upped 6 percent because of the new press recently installed for the Chadwick job. This job was still practically in the experimental stage and was running low production. Other jobs had been giving unusual trouble, and production as a whole was lower, which further increased the overhead.

"In the automatics, low production was mostly responsible for increased costs, although not entirely. The Bates job was behind schedule, and had to run three shifts every day with extra costs for overtime, at the same time that other jobs didn't keep the day shift busy.

I had worked to the bottom of a 16-page report covering a whole month's activities—a period that had ended six weeks ago

"One other item stands out. That's the Perkins valve which was running high scrap and large volume—"

"Are those jobs straightened out now?" broke in Sam.

"The report covers a whole month's activities," I explained. "Many of the things mentioned happened over six weeks ago. Today the Perkins job isn't running; the big press is running smoothly."

"Yeah," declared Sam, "next month we'll get another report along about the 15th telling us about a lot of things that are wrong right now. Then the cost department will have something else to crow about, and a lot of other fancy figures to show the Old Man."

He reached for the telephone, and told the operator to give him Jim Racine.

"Can you come to my office for a few minutes?" he asked Jim. "Yeah, right away. Okay."

Pretty soon Jim came in and sat down.

"Do you write these long-winded reports for your own amusement, or what?" Sam asked the comptroller.

"What do you mean?" countered Jim.

"Just what I say. Here it is the 20th of the month and the figures of this report cover things that happened six weeks ago. What good are they now?"

"A cost report," replied Jim, "is just what its name implies. It is a summary of things that happened during a given period of operation."

"That's right; a period of operation that is prehistoric. If I can wade through 16 pages of data, and make anything out of them when I get through, it's a nice record of mistakes."

"Well," asked Jim, "what do you

(*Continued on page 224*)

MAINTENANCE SERVICES

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

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FACTORY MANAGEMENT AND MAINTENANCE

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

MAINTENANCE as the Editors See It

Hot Weather Must Not Cut Down Production

SUMMER HEAT will shortly pose new problems for management and maintenance. Production must be kept at capacity volume, despite the slump in physical energy that workers suffer when the thermometer dances dizzily in the 90's.

Adequate ventilation, particularly around ovens and furnaces, will do much to keep temperatures within bounds. Segregating operations or equipment that give off large amounts of heat is also effective in keeping temperatures down. Unit heater fans will keep air moving and make it seem cooler. If cold water can be circulated through the heaters a positive cooling effect can be obtained at slight cost. Ordinary fans will often render yeoman service.

Workers want to, and should, drink large amounts of water in hot weather. Perspiration is the most effective means of cooling that the body has. Excessive perspiration, however, has the disadvantage of removing so much salt from the system that serious results may follow. Ordinary table salt, available in the form of small tablets, is an effective preventive measure. A day's ration may be anywhere from four to twelve tablets, depending on the temperature and the character of the work.

Use of heat-intercepting glass in windows and skylights exposed to the sun will do much to reduce interior temperatures. Painting ordinary glass with a suitable material is also well worth while. Shower baths are a big help in restoring tired bodies and flagging spirits at the end of a shift.

Any measures to eliminate summer slump are likely to be a rich investment.

Give Lighting Equipment a Real Bath

INSTALL MORE OR LARGER lamps is the answer that will usually be given to the question, "How can I get 20 percent more light?" Another answer to that question would be rendered by experts with wide experience in industrial lighting. Their answer would be: Wash all reflectors with soap and water and replace all lamps that are burned out or defective. That answer would not be 100 percent correct in all plants, but it would be near enough to the truth to deserve serious consideration in a great many others.

Designers of lighting equipment spend a great deal of time and money to produce equipment that will put as many lumens as possible to work. A plant makes a sizable investment in this equipment, after the layout has been carefully engineered. Everyone admires and is proud of the new installation for a few days. Then too often everyone, maintenance included, forgets all about it. At the end of a few weeks or months reflectors and lamps almost inevitably have acquired a coating that reduces the light output anywhere up to 40 percent.

The fact that the reduction in light output is usually too slight to be noticed from day to day probably accounts in part for the failure to keep luminaires clean. Preoccupation with other work may also be in part to blame. Whatever the excuse, it cannot cover up the fact that both workers and production suffer.

Wiping lamps and reflectors with a damp, and usually very dirty, rag is better than no attention at all, but it cannot take the place of a thorough washing with water and a suitable cleaning compound.

Get Good Oilers and Keep Them

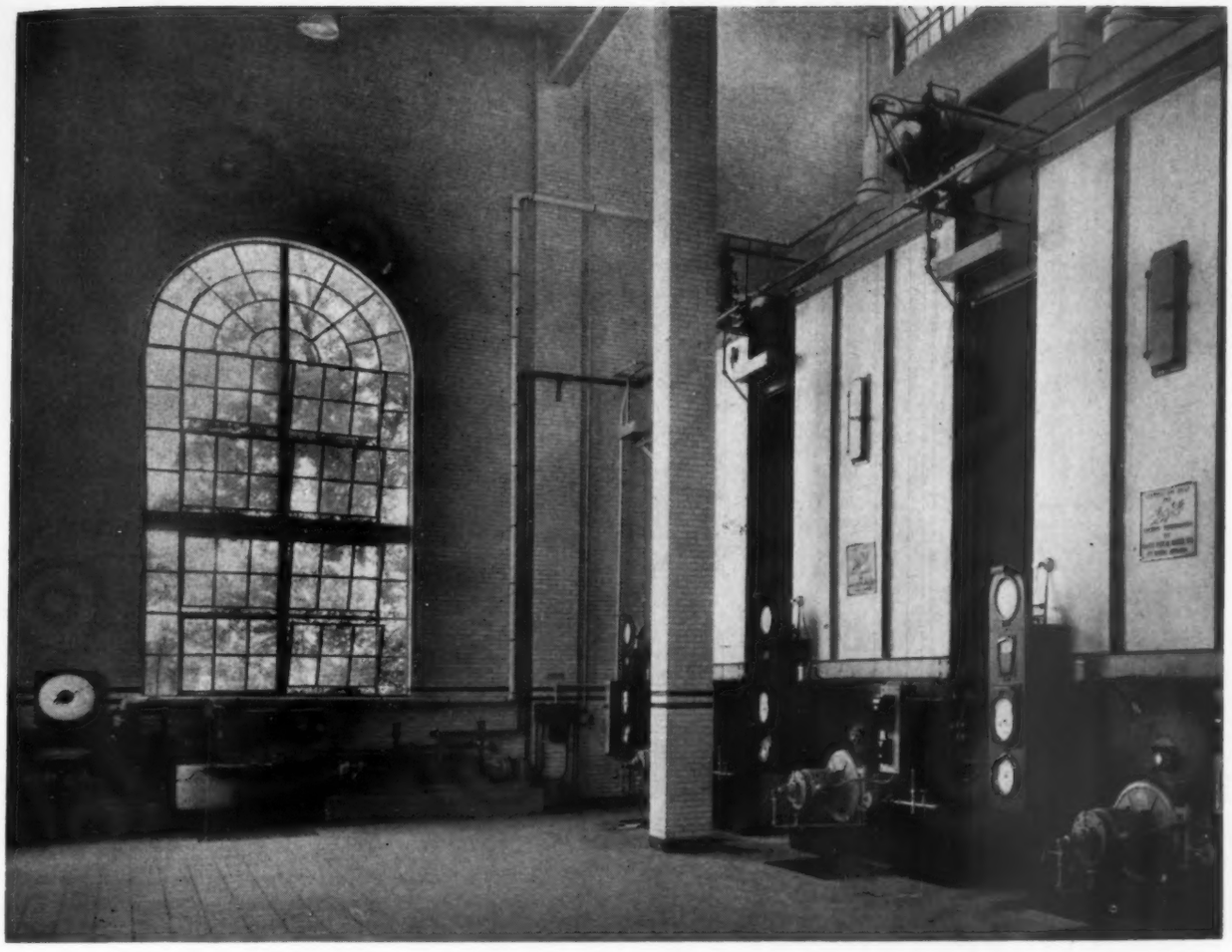
"ONE OF THE MOST IMPORTANT MEN in production today is a good oiler. An oiler can make or break the whole production set-up. Failure to do his job thoroughly can ruin capital investments running into thousands of dollars." This from an executive in an important war plant, who knows where the weak spots are.

It is not always realized, for example, that a good oiler is not created simply by handing just anybody an oilcan or grease gun and turning him loose. Nor is it always sound practice to transfer an oiler to some other job as soon as he has had a little experience and learned something about lubrication.

The prospect of promotion gives everyone a strong incentive to do his best, but other incentives may be just as effective. Pay commensurate with the importance of the job is one. Making the position of oiler an end in itself, instead of a stepping stone to some supposedly better job, is another.

A thin film of lubricant is all that keeps bearings and other rubbing surfaces from burning or wearing out in short order. Modern lubricating systems and devices greatly simplify the problem of keeping this film unbroken. But many machines, particularly old-timers, are not so equipped. They require personal attention.

Oilers who are skilled and conscientious are a valuable asset. Hang on to them.



How to Save Fuel Oil

Axis submarines plus transportation shortages render the conservation of fuel oil imperative

Prepared by the Staff of Socony-Vacuum Oil Company, Inc., New York

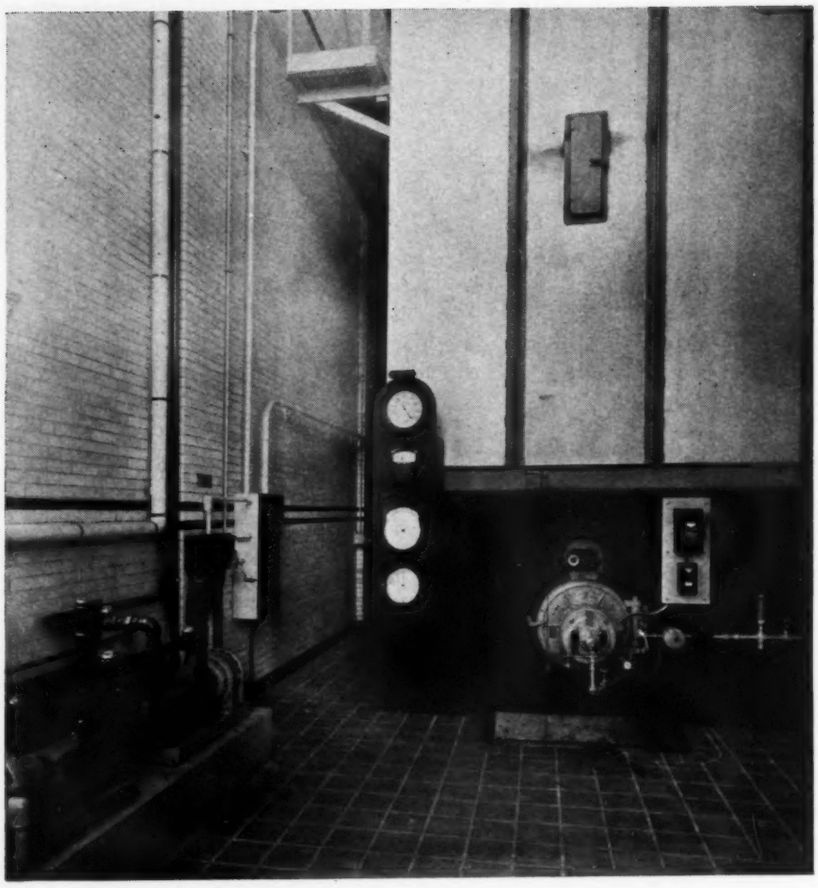
CONSERVATION OF FUEL oil has become a *must*. Rationing is here. Both have been brought about by difficulties in transporting oil in sufficient quantities from where it is produced to all the places where it is consumed.

To the oil industry, and to users of its products, conservation is not a new word. Government and the oil industry have long cooperated to conserve crude petroleum resources. Producers and consumers have worked together to promote efficiency in the use of petroleum. This effort has simply been good business for everybody concerned.

Need for conservation, however, has passed the stage where we can look at it from a "good business" standpoint. It is no longer just a matter of whether a saving in fuel oil will result in a lower unit cost of product. Naturally, all costs involved in manufacturing and processing are vital with today's price ceilings, and any economy is worth the attention of management. But oil conservation has now become a matter of making a limited supply go as far as possible.

The amount that any one plant may save may not seem important in itself but when multiplied by thousands of plants all over the country it will help to determine the quantity of oil that can be made available to all users.

In large industrial plants where great quantities of oil and other fuels are used to furnish power, tremendous strides have been made in securing maximum efficiency of utilization. Close watch is kept of instruments



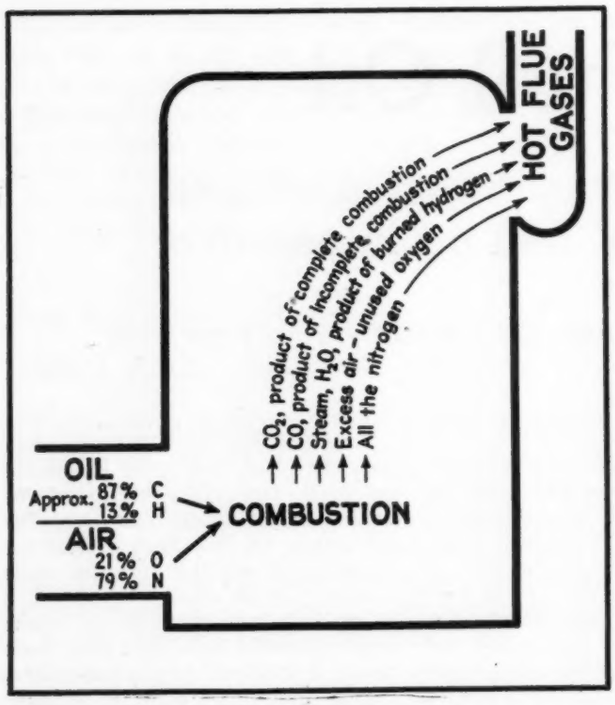
Maintenance of high efficiency is assured for this installation by instruments that indicate or record draft, CO_2, steam flow and pressure

and meters by which operation of the equipment is controlled and efficiency is measured in terms of the number of kilowatt-hours of electrical energy produced per gallon burned. This relationship is a positive check on the over-all efficiency of the plant.

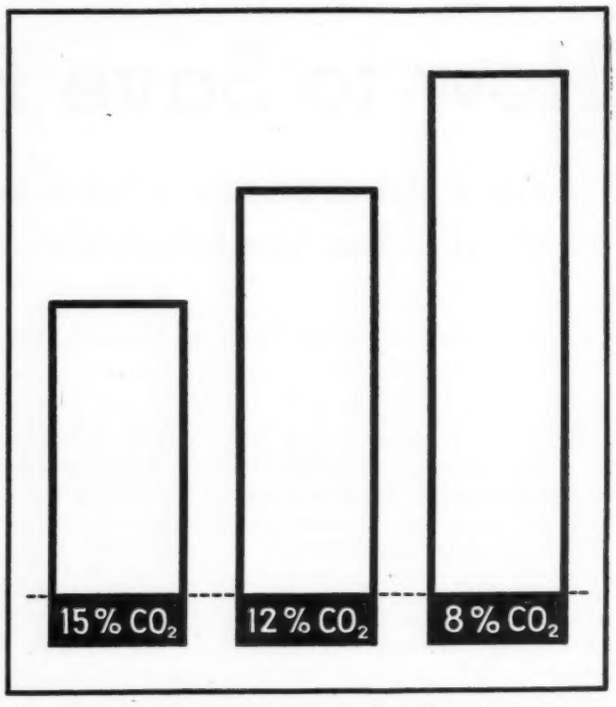
Where smaller quantities of fuel are consumed for heating factory buildings, providing process steam, in the heat-treatment of metals, for baking or drying various materials, or for furnishing hot water—less attention has been paid to the many ways in which heat may be saved. Before we can attempt to prevent waste of oil, it is necessary to know how waste is measured, what happens when this fuel is burned, and how the efficiency of combustion and of heat absorption are measured.

Regardless of the purpose for which oil is burned, the general principles of combustion and the factors that determine combustion efficiency and the efficiency of utilization are the same. For example, oil must be changed into a vapor before it will burn. In order to release all the heat in the oil the vapor must be intimately mixed with air so that it will burn completely. The products of combustion must be carried away to prevent smothering the fire.

Fuel oil is composed almost entirely of carbon and hydrogen. When it is completely burned, all the carbon combines with the oxygen of the air



Flue gases consist principally of CO_2, steam, oxygen from the excess air, and all the nitrogen in the air



As excess air increases, the percentage but not the amount of CO_2 in the flue gases decreases

Table I. Percentage of Heat Units Lost to Stack*

CO_2 (Orsat), Per-cent	Excess Air, Per-cent	STACK TEMPERATURES—DEGREES FAHRENHEIT									
		300	400	500	600	700	800	900	1000	1100	1200
15.0	5	5.45	7.64	10.2	12.5	15.0	17.6	20.2	22.8	25.3	27.9
14.3	10	5.60	8.06	10.6	13.1	15.6	18.2	20.9	23.6	26.2	28.9
13.6	15	5.71	8.34	10.9	13.6	16.3	19.1	21.8	24.5	27.2	29.9
13.0	20	5.98	8.71	11.4	14.2	16.9	19.7	22.5	25.3	28.3	31.1
12.5	25	6.26	8.98	11.8	14.7	17.4	20.4	23.3	26.3	29.3	32.1
12.0	30	6.54	9.36	12.2	15.2	18.2	21.1	24.2	27.2	30.2	33.2
11.5	35	6.76	9.68	12.7	15.7	18.8	21.8	24.9	28.0	31.2	34.3
11.1	40	6.91	10.0	13.0	16.3	19.3	22.5	25.7	28.9	32.2	35.4
10.7	45	7.09	10.2	13.3	16.6	19.9	23.1	26.4	29.8	33.1	36.5
10.3	50	7.30	10.6	13.8	17.1	20.4	24.8	27.2	30.6	34.0	37.6
9.7	60	7.85	11.2	14.7	18.2	21.8	25.3	28.9	32.5	36.2	39.7
9.1	70	8.40	11.4	15.6	19.3	23.0	26.8	30.5	34.3	38.1	42.2
8.6	80	8.71	12.5	16.5	20.4	24.2	28.2	32.2	36.1	40.3	44.4
8.1	90	9.25	13.3	17.3	21.4	25.5	29.6	33.8	37.9	42.2	46.4
7.7	100	9.80	13.9	18.3	22.5	26.9	31.3	35.6	39.9	44.3	48.8

** Based on lower heating value of No. 2 fuel oil, 35 A.P.I. gravity, 136,000 B.t.u. per gallon.*

Table II—Loss in B.T.U. Per Hour Per 100 Square Feet of Boiler Surface

Condition	B.t.u. Loss (Approximate)
Boiler uncovered	36,000
Boiler insulated with	
1 inch asbestos cement	13,900
2 inches asbestos cement	8,900
1-in. 85% magnesia blocks	5,100
2-in. 85% magnesia blocks	3,000

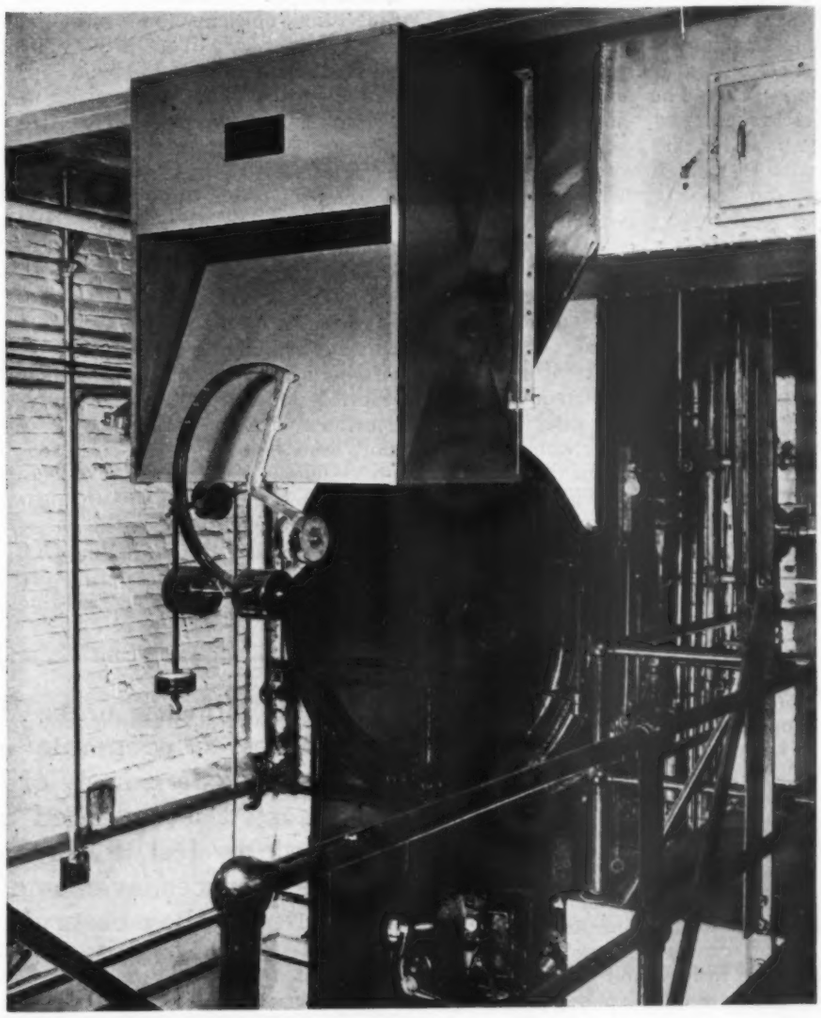
An automatic draft stabilizer, shown above the boiler, keeps draft approximately constant by opening or closing as required and thus keeps the efficiency of combustion high, regardless of atmospheric conditions

to form carbon dioxide or CO_2, while the hydrogen combines with the oxygen to form water vapor. If for any reason, such as insufficient air supply, flame impingement, poor atomization of the oil, low refractory temperatures, or lack of draft, combustion of the oil is not complete, carbon or soot is formed. This unburned carbon passes off carrying with it B.t.u.'s which constitute waste.

Cleanliness of combustion of oil is therefore the first requisite for efficient combustion. When this is coupled with the percentage of carbon dioxide in the stack gases, we have an indication of the completeness and efficiency of combustion. Efficient combustion of fuel oil produces a maximum of 15 percent CO_2 in the stack gases, with no smoke or soot. This is an ideal figure obtained with a minimum supply of air, possible only under most carefully controlled experimental conditions in the laboratory, and is not generally attempted in practice.

In practice, some excess air above the theoretical minimum is required to insure complete combustion. Twenty-five to 40 percent excess air, which would correspond roughly to 12 or 13 percent carbon dioxide in the stack gases, is considered about right for maximum combustion efficiency obtainable normally.

The reason why a minimum of excess air or a maximum CO_2 (which is the same thing) is desirable, is that every pound of air in excess of that



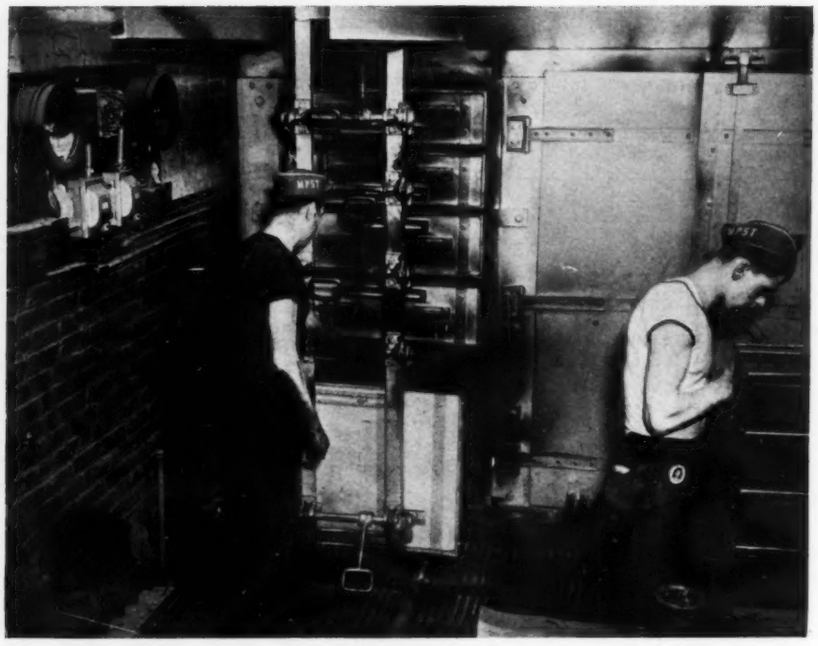


TABLE III—Percent Saving in Fuel Oil When Thermostat is Set Below 70 Degrees Fahrenheit

Thermostat Setting Degrees F.	Period of Reduced Temperatures, Hours			
	4	8	12	16
70	0	0	0	0
65	2.5	5.0	7.5	9.5
60	5.0	9.5	14.5	19.5
55	7.5	14.5	21.5	28.5
50	9.5	19.5	28.5	38.5

Insulation and close temperature control by equipment shown at the left help to prevent waste of fuel oil by this core-baking oven.

required for clean, efficient combustion, enters at room temperature and robs heat from the flame and the process. This stolen heat escapes up the chimney at the temperature of the stack gases. The difference between the low entering temperature of this air and the exit temperature, is preventable waste. Obviously, the greater the proportion of excess air so used, the greater the preventable waste up the chimney.

The products of efficient combustion and the excess air which passes through the furnace, are at high temperature. These gases eventually pass up the stack. Efficient operation of oil-fired equipment requires that temperature of these gases be lowered as much as practicable before they enter the stack. In other words, they must give up as much heat as possible to the boiler or process heat-absorbing surfaces. Therefore the so-called stack temperature is an important indication of how much of the heat produced is absorbed so that it can be put to work. Obviously, a high stack temperature, say 600 degrees Fahrenheit or above, means that too many heat units are escaping.

Conversely a low stack temperature, 400 degrees Fahrenheit, is a general indication that heat absorption is satisfactory. Table I shows the relationship between CO_2 content and excess air in the flue gases, and the percentage of heat lost up the stack at various stack temperatures.

Draft causes fresh air to be drawn into the furnace and the products of combustion to be expelled up through the stack. Suffice it to say here that draft exerts an important influence on combustion efficiency and must be closely controlled. Too little draft allows back pressure to build up, smothering the flame, and resulting in incomplete combustion. Excessive draft causes incomplete oil gasification and excess air which result in low CO_2 or poor combustion efficiency.

How then can we determine the efficiency of our oil burners and boilers, and how should we proceed to keep them at peak efficiency?

Obviously, readings of CO_2, stack temperature, and draft will quickly tell whether we are burning needless quantities of oil that might better contribute to our country's victory effort somewhere else. These readings can easily be made by your oil supplier or by anyone who is familiar with oil-burning equipment.

By demanding the maximum CO_2 content in the flue gases with absence of carbon or soot and by insisting on a low stack temperature, you may well be surprised at the amount of oil saved. To be sure, meeting these demands may involve some adjustments —overhauling the burner unit, a reconstructed combustion chamber, perhaps the installation of a draft stabilizer, if one is not used at present, even some rebuilding of a stack. But the costs involved will usually be quickly overbalanced by the economies effected in oil consumption.

A good place to look for further economies is in the boiler or process equipment. They must do a good job of absorbing heat. Stack temperature indicates how much heat is lost, and how much is absorbed. The design of the equipment—the type of flue passages or heat-absorbing surfaces, the size and relation to the job to be done and to the burner—are all factors that determine efficiency. A good combustion engineer can quickly advise whether your boilers and process equipment can do their part in con-

The oil industry urges the management of other industries to cooperate in every way possible in conserving the supply of fuel oil. If every gallon of oil wasted is regarded as a gallon of oil that is irrevocably lost to our industrial plants and to the armed services, even small savings will be given the importance they deserve. Waste of fuel oil must be stopped *now! Oil is ammunition. Use it wisely!*

Little oil is wasted in heat-treating furnaces if temperature is controlled, combustion watched, and equipment shut down when idle

TABLE IV—Estimated Waste of Fuel Oil When Thermostat Is Kept Above 70 Degrees Fahrenheit

Average Yearly Requirements Gallons	Oil Wasted Yearly When Thermostat Setting Is: 75° F.	80°F.
3,000	428	856
3,500	500	1,000
4,000	571	1,142
5,000	714	1,428
10,000	1,428	2,856
15,000	2,143	4,286

serving our oil supply. Sometimes a new boiler may be needed or a change in process may be required. More often proper baffling may be resorted to to give increased efficiency.

An accumulation of soot $\frac{1}{16}$ inch thick on boiler surfaces, may cause a fuel loss of 5 percent. Does that look small? Add up a few of these 5 percents and you acquire a sizable percentage of fuel saving. Any spare labor in a plant can easily be taught how to remove this soot. It should be done periodically at intervals depending on how well the burner is adjusted.

The condition of the water in the boiler, too, might well be examined. Water with a thick floating scum not only has a detrimental effect on the entire heating system, but requires excessive heat to produce steam. Any competent engineer can tell whether a boiler should be drained and treated with a boiler compound.

Equipment should be adequately insulated. If insulating cement is used it should be at least 1 inch thick, preferably 2 inches. Various materials are available for this purpose. Table II shows the gain in fuel economy when a boiler, heat exchanger, or process equipment is properly insulated.

If the efficiency of combustion assures the conversion of every drop of fuel oil into the maximum amount of heat, and if the heat is absorbed with maximum efficiency, the next place to look for fuel saving is in the distribution of that heat.

From the time that steam or hot water leaves the boiler until it reaches the place where it is to be used, insulation should guard its valuable heat content. Insulating steam or hot water pipes assures getting the maximum amount of heat to the spot where it is needed. Uncovered pipes, especially when they are in contact with the outside walls of a building, can waste a large amount of heat—and oil.

Mains and return pipes in the system should be checked by a competent steamfitter for correct pitch. In fact the whole layout of the heating system should be carefully examined to make sure it is not defying some of the principles of heating. Incorrect piping may make it necessary to produce excessive amounts of steam, or hot water, in order to get heat to some point. Or it may fail to deliver heat at all. Where hot water is required the use of a circulating pump will frequently result in fuel savings.

Why Heat Ceilings?

Improper radiation can waste quantities of fuel, and still fail to do a good heating job. In many industrial installations radiators are located high up on the walls. Since heat travels upward this arrangement keeps the ceiling warm but doesn't help the workmen much.

Relocating the radiators at floor level, against an outside wall or a window, will cut down the time a burner has to operate in order to provide the same temperature in the shop.

Hand-controlled unit heaters with blowers may chill factory workers rather than warm them. If these blowers are allowed to run when there is no heat in the units, they simply blow cold air and reduce the temperature of everyone within range. Automatic control is the safest way to make sure that heaters do not operate at the wrong time.

Where else can we look for fuel waste in a plant? A few miscellaneous economies will be mentioned here but, more important, a careful examination of any plant will usually uncover a good many others.

Maintaining too high a temperature for manual labor wastes fuel in many plants. For many types of work the men are healthier, more comfortable, and therefore more efficient, at a temperature of 60 degrees Fahrenheit, if the relative humidity is not too low.

Even in an office 70 to 72 degrees Fahrenheit should be warm enough for any employee who is sufficiently clothed. If the thermostat that operates the plant heating system is located in the office, the amount of radiation throughout the shop should be apportioned to provide the proper temperature at each location. A checkup here requires no more than a thermometer, but the adjustments may demand the services of a good steamfitter.

Zone control is another and more accurate way of maintaining the correct temperature in each zone or section of the plant. With it an individual thermostat stands guard over the temperature in each section. This thermostat regulates the flow of steam to each section separately.

Another source of fuel saving is in the prevention of heat loss from a

building. Insulation saves 25 to 40 percent in some constructions.

Double glass in plants with skylights results in even greater savings. Normal single glass loses from two to three times the amount of heat that is lost with a concrete roof.

Reflectors behind radiators will prevent radiated heat from being lost to the outside walls. They reflect heat back into the plant and thus increase the radiators' efficiency.

Turning down the thermostat when the plant, or part of it, is not in operation will effect savings that may range from 5 to 40 percent (Table IV).

The discussion thus far has dealt primarily with burner-boiler systems. Nevertheless in the many furnaces where fuel oil is used for heat-treating metals, good possibilities exist for savings. Whether reducing, neutral, or oxidizing atmospheres are employed it is possible to establish definite percentages for the CO_2 content of the stack gases. Maintaining these percentages closely will not only aid in the conservation of fuel but will provide more uniform conditions.

Other economies in the use of fuel oil may be possible through careful planning of work. Again, it may be found feasible to shut down furnaces that are on part time and run the others on a continuous and more economical basis. In addition to conserving one of our most vital materials, such expedients may effect an over-all saving for the plant.

Check Chart for Oil-Fired Heating Boilers

If over-all efficiency is not 70 percent—CO_2, 10 percent minimum; stack temperature, 550 degrees Fahrenheit, maximum — check:

THE OIL BURNER

1. Check the oil pressure. Make sure it is correct for best atomization of the oil.
2. Check the burner nozzle for correct capacity, correct spray angle. Make sure it is clean and free from obstructions.
3. Check the ignition. If electric, make sure electrodes are clean. If they are dirty, check position to make sure they are out of oil spray, but close enough to it to insure immediate ignition. When ignition is gas or gas-electric make sure parts are properly adjusted, and clean.
4. Check the burner air supply. Are air shutters set for minimum excess air and maximum CO_2? Is the air screen clean? Are the fan blades clean? Are burner air tube and diffuser clean and properly positioned? Make sure that air is delivered in proper quantity and at adequate velocity.

THE COMBUSTION CHAMBER

1. Is it correct size for the load?
2. Does the nozzle produce a flame that fits it?
3. Is flame impingement causing coke and soot formation?
4. Do the design and material assure utmost turbulence and dispersion of the flame?
5. Is the chamber insulated?
6. Does it heat up rapidly and show a uniform over-all glow when flame is shut off?
7. Are there any cracks or evidences of air leaks that should be sealed?

THE DRAFT

1. Is there a draft stabilizer?
2. Is it properly installed and set for ideal draft over fire?
3. Is the stack adequate, free from obstructions and leaks, of correct capacity and height, unimpeded by surrounding objects?
4. Are the smoke pipe and boiler breeching properly designed and air tight?

THE BOILER

1. Is it of correct capacity for the load?
2. Is it being fired at a rate that will carry the load at highest efficiency?
3. Is it designed for efficient heat absorption with oil fuel, or does it require baffling to overcome design features likely to waste heat up the stack?
4. Are the heat-absorbing surfaces clean on the fire side and water side?
5. Are the boiler and accessories properly insulated?
6. Is the boiler air tight? Are there air leaks around the setting, burner mounting plate, boiler doors, or elsewhere, that should be sealed to prevent excess air infiltration?

THE HEATING SYSTEM AND HEATING PROCESSES

1. Is heating adequate and uniform?
2. Are radiators and heat exchangers adequately sized and properly placed?
3. Are unit heaters automatically controlled?
4. Are thermostats and aquastats correctly placed? Are they set at the lowest value consistent with reasonable heating results?
5. Are traps in good condition?
6. Is there steam leakage any place in the plant?
7. Is there ample insulation on all mains, pipes, risers, and other high-temperature elements?

With Right Care, Conveyor Belts Will Carry On

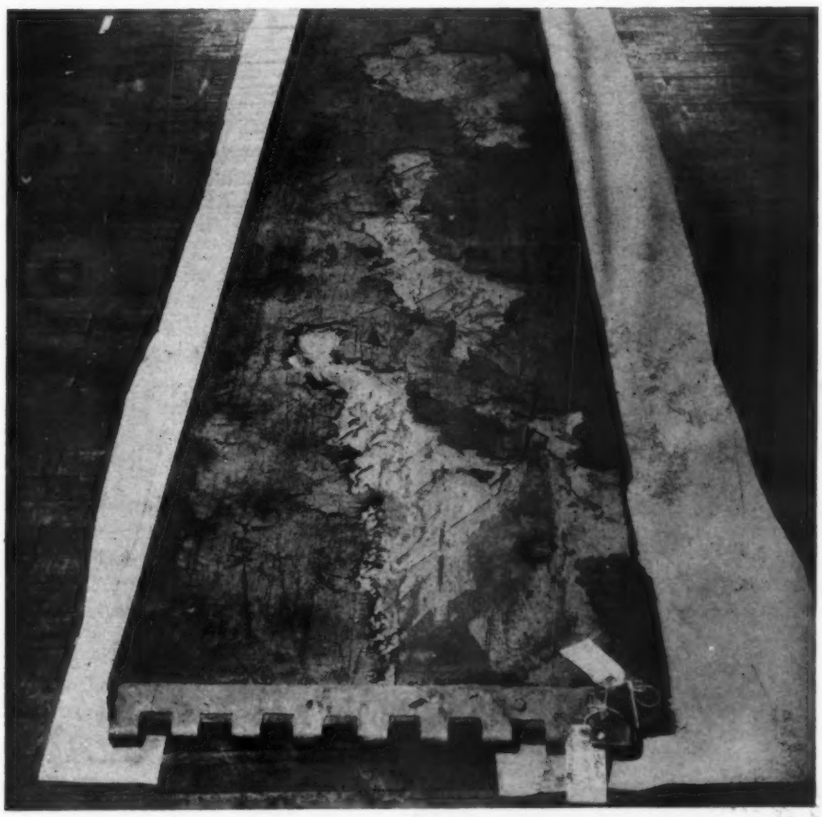
Conveyor belts draw down tough assignments. New belts are increasingly difficult to get. Pamper those you have a bit and they will serve you longer and better

P. D. SULOFF, Mechanical Goods Development, The Goodyear Tire & Rubber Co., Akron

SERVICE LIFE OF CONVEYOR BELTS ranges from the handling of a few hundred yards of tunnel muck to 50,000,000 tons of ore on a single belt. These extremes represent widely different operating conditions and there is not any way to persuade a mucker belt to carry anything like 50,000,000 tons. However, proper analysis of a conveying job, and correct care of belt and equipment, plus watchfulness, can have a definite influence on the life of the belt.

In the selection of replacement belts, the nature of previous failures provides information on features that require correction and improvement. In many cases, experience gained through the continual use of belts on a given type of job has led to special belt constructions designed to overcome the particular hazards. For instance, a conveyor used underground in coal mining led to the development of a belt in which the edge portions of the pulley surface slide while the center portion is supported on rollers. The entire belt is designed for a minimum of pull-down in width, under tension, to prevent the passage of material around the edges.

So many combinations of cover quality and thickness, carcass strength, and quality and amount of carcass rubber are possible that there is usually some means of improving the portion of the belt that fails. A nearly perfect balance of belt elements for the job can be obtained.



Damage to conveyor belt cover caused by extremely severe loading conditions. Relieving the loading strains will prolong the belt life

With a new belt, the task of utilizing all there is in that belt is just begun. With regular help in the form of inspection, repair of damage, and removal of the cause of damage, it can be made to do much better than the previous belt.

The most common type of conveyor belt fastening is that using a series of metal plates on both top and bottom of the belt. These plates are pulled partially into the covers by countersunk bolts passing through the belt, and are satisfactory for ordinary operating tensions. It is necessary that they be of proper size and that the bolts be kept tight. Loose bolts may allow fasteners to pull out. Belts are sometimes ripped longitudinally by partial fastener failures. Fasteners should be inspected regularly to prevent pull-out, failure, and belt damage.

Many conveyor belts are being made endless by use, in the field, of electrically heated vulcanizers. The expense of the job is usually repaid in freedom from fastener failure.

A conveyor belt, recently replaced after handling 30,000,000 tons of run-of-mine coal over a period of nearly eleven years, was removed with all its original vulcanized splices still in place.

The first few days of operation are the most hazardous the belt is likely to encounter. During this period the belt is limbered up and trained, and equipment adjusted to accommodate its characteristics. Watchfulness can prevent damage, particularly to belt edges. Training the return run of the conveyor is especially important. This part is usually out of sight under the deck and does not get much

thought until the belt starts to squeal or smoke. With the return run well trained, and feeding well centered to the loading chutes, the top run when loaded will almost take care of itself. Self-aligning return rolls, automatically centering the belt, are as important as the more common self-aligning troughing stands. These rolls prevent edge damage to the belt and assist in getting a well-centered load. The top run of a belt, loaded off center, can never be properly trained because it requires carriers in one position when loaded and another position when empty.

Head and tail pulleys seldom require adjustment in training the belt. Snubs have considerable influence and can be adjusted to correct a tendency to run continually to one side. Gravity take-up carriages can be dangerous to the belt, particularly those running on tracks. Rails and wheels should be kept clean and provision made for positively retaining wheels on the rails. In correcting misalignment of any pulley, do not be misguided by the old statement "a belt runs to the high side." It runs to the high side of conical (crowned) pulleys when shafts are parallel, but when shafts are not parallel the belt runs toward the convergence of the shafts.

It is a common practice to tilt carrying idlers forward slightly (about 2 degrees) to assist in training. This is useful and effective, but too much tilt has been known to score the shells of the idler rolls and to abrade the pulley cover of the belt because of the rotation of the two inclined rolls on an axis not at right angles to the path of belt travel.

Loading the ordinary conveyor is properly given first thought. Ideally loaded material should be deposited on the belt at the belt speed, in the direction of belt travel and at a rate which will keep the belt full. Speed of material and its direction at the time it strikes the belt are determined mainly by the loading chute.

It is desirable that fines be loaded first and lumps placed on top. This action takes place naturally to some extent but can be aided, in the construction of the chute, by tapered grizzly bars at the lower end, which carry lumps beyond the point where fines begin to drop to the belt. With materials that tend to lodge in the slots between grizzly bars, the same purpose has been accomplished by cutting back the lower center of the chute so that fines drop while the lump is yet supported by the edges.

In general, the direction of material leaving the chutes is such that the vertical component of the energy of the falling material must be absorbed by the belt and its supports. Where chutes are steep, or non-existent, the belt may be damaged by large lumps. Protection can be given the belt by providing resilient supports under the loading point. Although rubber-covered idlers are the simplest pneumatic tire idlers have important advantages.

Sharp-edged material leaving the chute at much greater or much less speed than that of the belt may cause cutting even though its vertical component is small. Decreasing or increasing the angle of the lower end of the chute may be the remedy. There is evidence that wet belts cut more readily than dry.

Tied in with the chute is the skirt board problem. It is next to impossible to lay a full load on the belt from a chute without skirt boards at the loading point. Many belts suffer more damage under the skirt boards than at any other point. This damage is usually caused by hard, sharp particles wedged between the lower edge of the skirt board and the moving belt surface. These scratch and gouge the belt until the piece of material is finally carried free or crushed.

To keep these sharp particles out of the space under the skirt boards the rubber sealing strips must be replaced when they have become worn and the edges of the belt supported at the point of loading so they are not forced down by the impact of the load. Support at the loading point can be provided by short, endless pad belts or pneumatic tire idler stands. These methods tend to hold the edges of the belt up against the skirt but are still yielding to the impact of material striking the center portion.

To minimize damage caused by any particles that do get under the skirts, it is desirable that the gap between the belt and the metal portion of the skirt board become greater in the direction of belt travel so there can be no wedging.

Belts are sometimes damaged at the discharge point by the arrangement of the chute. The belt, coming up to speed or stopping, does not throw the material out into the chute; lumps may drop down and plug between the head of the chute and the belt. Probably the safest practice is to leave space between the pulley and the head of the chute for the entire load to drop behind the chute during starts and stops. This material can be picked up by a chute or pan below the pulley and directed to the following belt.

(The second and concluding installment of this article will be published in an early issue.)

A severe loading condition that requires attention to skirt boards

GOOD HOUSEKEEPING

Past 40, this oldest of Goodrich buildings. Perpetual clean-up campaign prevents it from looking its age

A CASE STUDY in plant clean-up at The B. F. Goodrich Company, Akron, where a stay-with-it crusade pays off in tons of salvaged materials, acres of recovered floor space, scores of accidents that cannot happen. Prepared for *Factory* by Paul B. Plant, chairman of the Goodrich Good Housekeeping Committee

WITH EVERY WAR PLANT in the country howling for raw materials and equipment, the matter of overhauling a plant for any salvageable items becomes one of definite military importance. We at The B. F. Goodrich Company have been working for some time on such a project.

Ours is a fast-changing business and one with many headaches. It is not surprising if in the strain of improving tires every year and keeping up with steadily dropping prices, we have not always made the effort to keep our factory buildings clean. But with the world's greatest war threatening us, we found it worth while to institute a thoroughgoing system of factory clean-up. It has not been a mere now-and-then job with us, but a stay-with-it crusade. All of us have been surprised to find out how much can be uncovered and discovered—and we're not done yet.

Unused motors, discontinued piping and fittings, wiring and controls of various kinds, and even machinery that had been almost forgotten, all came to light in our good housekeeping campaign. Various types of valves were returned to stock, overhauled, and used again. Piping was salvaged and used again. Temperature control and other recording instruments were brought to light and used again in new and important places. Motors, switches, metal shelving, tables, trucks, hangers, and chain blocks were brought out of hiding and put into service again.

Frequently our searches brought to light machines or parts of machines

Dirt and disorder, abuse of factory equipment, difficulty in handling raw materials and finished goods . . .

that had been fully amortized and written clean off the books. But there they still were, and in a time like this there was a definite military importance in doing something about such discoveries.

What we did has been so revolutionary that if we had not saved some before-and-after pictures we should hardly believe it ourselves. We cleaned up storage piles. We found more room to work in, by getting rid of non-essentials. We gave workmen better facilities, more room, and more light. We reduced accidents and damage to materials. We developed better *esprit de corps*. We increased efficiency. And we cut waste.

Right now, with war demands calling for new machinery, it is important to make the fullest possible use of every idle machine. So we have adopted a simple system. If a machine wasn't doing a job at the place where it stood, we took it out. Then it was just a question of two things:

Can we use this machine elsewhere in its present shape?

Can we sell it "as is"?

If not, we break the machine up and sell it for scrap. The system is as simple as that.

In checking through the 165 acres of floor space that make up the Goodrich factories at Akron we released hundreds of tons of useful material, largely steel, but also copper wire and even considerable rubber. We released the scrap metal to help lick the Japs.

Also we got rid of dust and dirt that used to drop from unused fixtures overhead.

Help From All Sides

While we were at it, we rearranged some departments for greater efficiency. As always, one step leads to another. A lot of people do not get the idea of a clean-up campaign until they see some actual results. Then, with a sample to work from, it is surprising how many helpful suggestions are received from all sides. This overhauling of departments has resulted in a course of schooling for our supervisory staff, so that the level of our supervision has been appreciably lifted.

These benefits have an actual cash value in themselves. Beyond this, in times like these when the government checks the efficiency of a plant before it awards any war orders, there is a special need for cleanliness and efficiency.

"Does it cost more to run a clean factory than when you used to let things be messy?" Visitors often ask this question.

It costs less.

Once a factory is clean and a system is worked out for keeping it clean, *less* time and effort are required than before. And among the results is a greater self-respect all through the organization.

"Did the men resent the change?"

Well, some of them thought it was a little silly at first. After all, this is a factory making all manner of products, many of them heavy and bulky. It is *not* a beauty parlor or a lady's tearoom. But once the workmen could see the actual results, they were —and are—enthusiastic about the campaign.

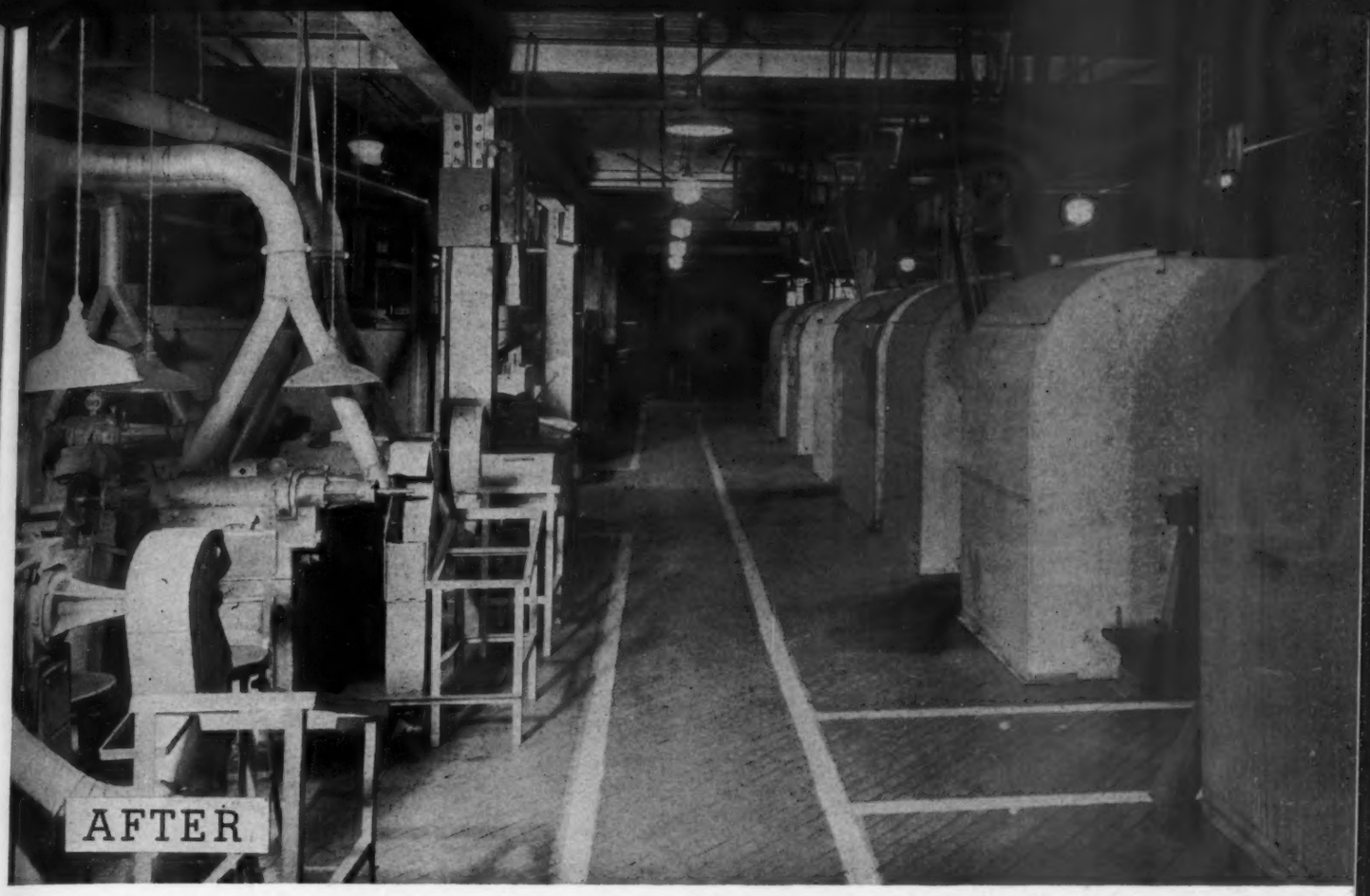
"How did you sell the idea?"

With the tough ones we sometimes got tough. With the easy ones we went easy. But generally we used illustrations and diplomacy.

For instance, in one department a saw was trimming boards, and the ends fell on the floor. Our inspector spoke to the foreman about it. The foreman got huffy.

"What do you think I am, a clean-up man?" he asked.

"No," said the inspector, "I'm just trying to save you some work. This rubbish has got to be picked up eventually, and it will save you time if you



. . . fall back for good and all before the irresistible forces of pick-up, clean-up, put-up, and paint-up

do it now. Why not bring that trash can over here and let the pieces fall into it?"

The inspector moved on. When he came back a little later the trash can was in use and the floor was being kept clean.

The clean-up campaign lifted things off the floors and put them on racks and into bins. Where bins were not provided, we sometimes built them out of packing cases. All tools are hung up or stored on shelving. All bar steel is sorted by size and length, and arranged to point in one direction. Fittings and other items are laid out in an orderly and systematic way. It is surprising how much neater our storeroom looks now. What's more, if we need something in a hurry, we can find it if it's there. Delays and shutdowns are eliminated because storekeepers know what they have and can fill a requisition in a matter of seconds.

Boxes Neatly Stacked

The orderliness takes in materials waiting for their place in production, also boxes of finished products waiting for shipment to customers. These things are now stacked neatly, generally to a uniform height, inside of painted lines.

We leave a space around skid platforms. Now we can get any pile we want out of a stockroom without tipping over something else.

At night we park our four-wheel trucks in little "parking lots" painted on the floor. Trucks are all headed the same way. Every man's gear is arranged neatly.

As part of the clean-up campaign we painted miles of traffic lanes throughout our factory buildings. The paint we use is a deep yellow—the same color the Akron police department uses for its traffic lanes downtown. We could have found cheaper paint, but we intended this reminder to be as official looking as possible, and to have it suggest that this was a police order, without actually putting that message into words. Also, yellow is a cheerful color.

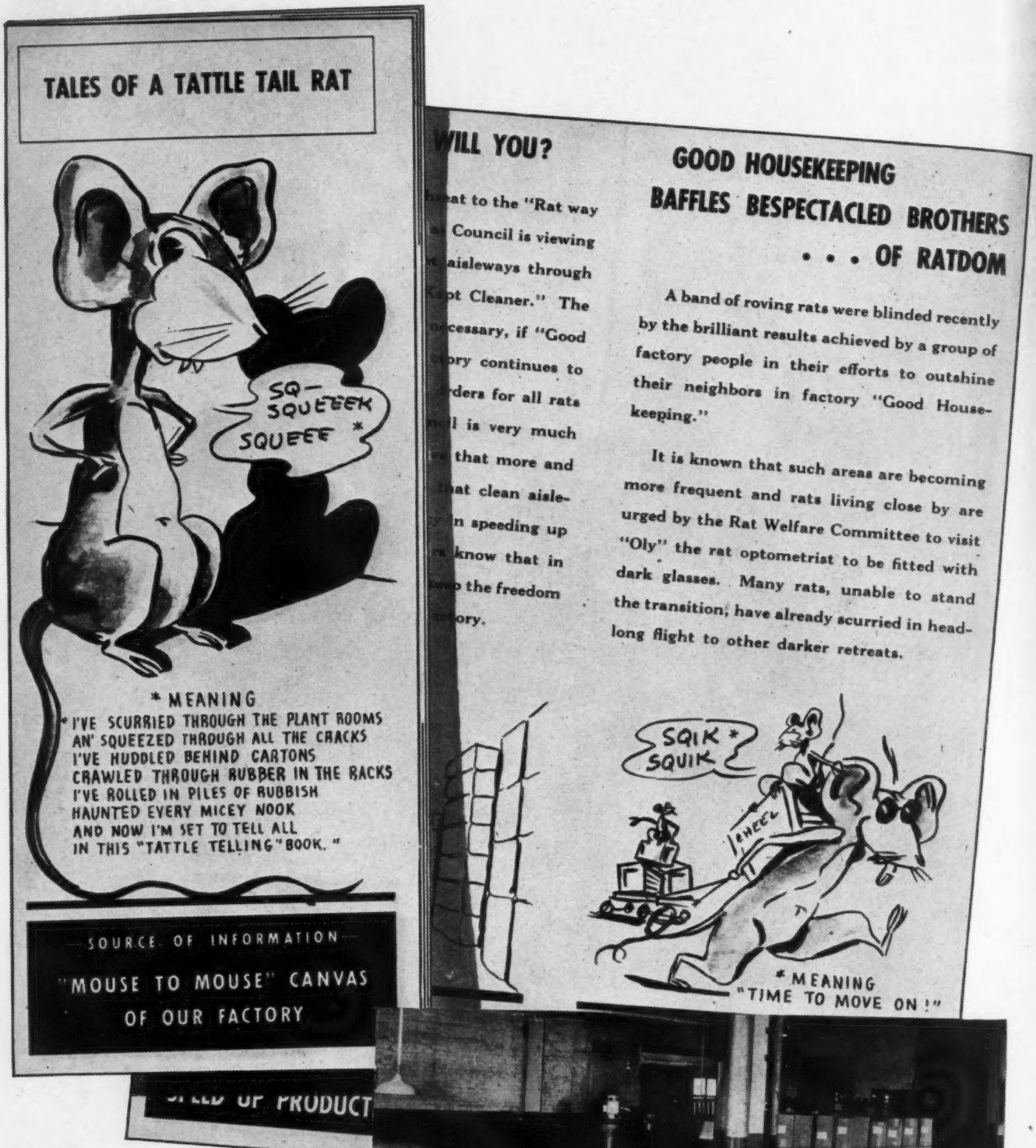
These traffic lanes indicate the "streets" where trucks can operate in safety. Likewise these lanes mark spots where anyone on foot can stand without being hit by a truck. While we were at it we painted a space around each machine, a safety zone for the workman operating that machine. All this has helped our trucks get going quicker and keep going at a faster clip, with less risk of hitting anything or hurting anybody.

The clean-up campaign also tidied up the corners around cuspidors. Some of our workmen chew tobacco; solvents used in rubber manufacturing make smoking around a rubber factory out of the question. Places must be provided where men can spit. But men can hit the cuspidor more accurately when it is placed handily, and will resist the temptation to let fly in a corner when the stairway corners and such are touched up with bright yellow. In this and other things, when we got things clean and provided ways in which they could be kept clean, they surprised us and themselves by obliging.

Worth Salvaging Now

We let the clean-up campaign follow through to the yards, truck platforms, and even our graveyards. Here again we found some stuff that had looked like useless junk in pre-war times but is rare and worth salvaging right now. Also, we left every spot, even the company dump, cleaner and in better shape when we got through with it.

This good housekeeping campaign is not something sporadic with us. We have seen clean-up campaigns that are fussy for a few days or weeks but relax and go to pieces when the push behind them stops.


TALES OF A TATTLE TAIL RAT
SQ-
SQUEEEK
SQUEEE *
* MEANING
I'VE SCURRIED THROUGH THE PLANT ROOMS
AN' SQUEEZED THROUGH ALL THE CRACKS
I'VE HUDDLED BEHIND CARTONS
CRAWLED THROUGH RUBBER IN THE RACKS
I'VE ROLLED IN PILES OF RUBBISH
HAUNTED EVERY MICEY NOOK
AND NOW I'M SET TO TELL ALL
IN THIS "TATTLE TELLING" BOOK.
SOURCE OF INFORMATION
"MOUSE TO MOUSE" CANVAS
OF OUR FACTORY
WILL YOU?
GOOD HOUSEKEEPING
BAFFLES BESPECTACLED BROTHERS
• • • OF RATDOM
A band of roving rats were blinded recently by the brilliant results achieved by a group of factory people in their efforts to outshine their neighbors in factory "Good Housekeeping."
It is known that such areas are becoming more frequent and rats living close by are urged by the Rat Welfare Committee to visit "Oly" the rat optometrist to be fitted with dark glasses. Many rats, unable to stand the transition, have already scurried in headlong flight to other darker retreats.
SQIK *
SQUIK
WHEEL
* MEANING
"TIME TO MOVE ON!"

Clean-up campaigns are rough on rats, according to 16-page "mouse-to-mouse" canvass of factory (above). Light treatment of heavy subject is aimed to keep up interest in clean-up crusade

Storage areas (right) are laid out like parking lots. A space for each item. Everything in order. Aisles cleared for action

MR. SUPERVISOR:

The first Goodhousekeeping inspection of the Third Semester has come to a close. Your superintendent will be furnished a copy of the grade sheet for his division. Some of you will be complimented -- others will not. There will be a short interval, then the second inspection will start. In the meantime you will want to check over your department and eliminate the weak spots. USE YOUR SPECIFICATION SHEET -- AND POSSIBLY SOME OF THE FOLLOWING HINTS CAN BE UTILIZED BY YOU. DON'T GET CAUGHT SHORT AGAIN.

GOODHOUSEKEEPING COMMITTEE

****

1. Paper, scrap fabric, sheet metal, pans, etc., placed under a machine where glue, paste, cement, paint, etc., are used will catch the surplus and keep the floor clean. Article used can be changed regularly—relieving unsightly accumulations under the operation.
2. Painted aisle lines, storage spaces, etc. will help your employees in aligning equipment, storage, tools, etc.
3. Where possible, start your storage at the aisle line and work toward the wall. This will keep a regular contour along the aisle.
4. Endeavor to store like articles together, and keep storage at uniform heights.
5. Try to regulate your storage--whether stationery, stock, compounds, or boxes. Analyze your needs carefully.
6. Proper containers help--whether for scrap paper, rubbish, stock, finished product, or what have you. A neat paint job also improves their appearance.
7. Rearranging of storage, tools, and equipment may relieve a congested condition.
8. Don't be secretive with your dirt and rubbish--that is, don't hide it in drawers, cupboards, cabinets, files, etc. GET RID OF IT.
9. As soon as specification or order sheets are obsolete, take them down. If there are some that are dirty, and still needed, have your clerk rewrite them. Old picture frames, mirrors, department bulletin boards, if no longer used, should be taken down.
10. Don't let your machinery get so dirty it is difficult to identify the machine. Ever try cleaning and painting it? Also hoe out under it once in a while. It will help.
11. Establish a regular daily cleaning routine. If there is a dirty or disorderly condition on the floor assigned to you, your department is responsible.
12. If you have a particularly difficult problem (dirt, waste, building in need of repair, lack of paint, poor lighting, congestion, etc.) talk it over with your general foreman or superintendent.
13. WHISKERS: Some departments still need a shave. (Strings, wires, rags, etc. hanging on walls, ceilings, machines, racks, skids, pipes, structural, etc.)
14. See that your fire blanket and stretcher boxes are neat and clean.
15. A clean and orderly office is an incentive for the employees on the floor to keep their sections the same way. How does your desk look?
16. Ever discuss Goodhousekeeping with your employees? (If not sold on it yourself, don't do it.) Several foremen are accomplishing miraculous results thru this method. TRY IT.

GOODHOUSEKEEPING will reduce Waste, increase Efficiency, promote Safety, eliminate Fire Hazards, produce more healthful working conditions and a better morale among the employees. IT HAS BEEN PROVED.

Check-list issued after inspection and grading in the third "semester" of the "college course" in good housekeeping gives department heads something to shoot at, and warns them not to get caught short again. Item 13 on "whiskers" illustrates the light touch that is injected into campaign literature.

The success of our campaign is due to the fact that it is not just a gesture on management's part. Rather, the idea was given to the factory itself, and we have accepted it as a permanent assignment—one we believe in and thoroughly enjoy.

Our good housekeeping committee is not a weak sister. Rather, it is made up of six of us, all with long years of company experience. Five are production superintendents, one from each division. We report directly to the works manager. I might say that, even though at the start each of us had to put in two or three afternoons or nights a week getting the campaign started, we have found this work to be a pleasure instead of a bore. Whenever we stop our check-ups for a while someone is sure to ask:

"When are you going to begin your plant visits again?"

Learn From Others

The reason for that interest is that our clean-up campaign has educational benefits even for a plant superintendent. Each of us finds he can pick up ideas in someone else's department that help solve a problem in his own bailiwick.

Our good housekeeping committee makes periodic inspection trips and grades each department. You might ask how we can grade several hundred departments on a uniform basis. Some departments are storage rooms; some make rubber gloves or hot-water bottles; others make tires, gas masks, conveyor belting, caterpillar treads, bullet-proof gas tanks for bombers, and de-icers.

"How in the world," people ask, "can you grade all these different departments, located in a lot of separate buildings, in a way that is fair to everybody?"

Well, there is no set way to grade a department. Each one is a problem, depending on the building, its age and condition, the people in it, and the product. A department equipped with new walls and all new machinery ought to show a higher general cleanliness than one with old machinery. That much is only fair.

The one question we ask is:

"Is this foreman doing the best he can with what is given him?"

That is all that counts.

We can truthfully say we have had no complaints on our grading system. And our standards are stiff. We demand that each department live up to 85 percent of possible cleanliness and neatness.

Each of our six committeemen makes out a score-sheet for each department he visits. Then we average the figures. When we find any that are badly out of line we go back and re-check. But the figures come surprisingly close together.

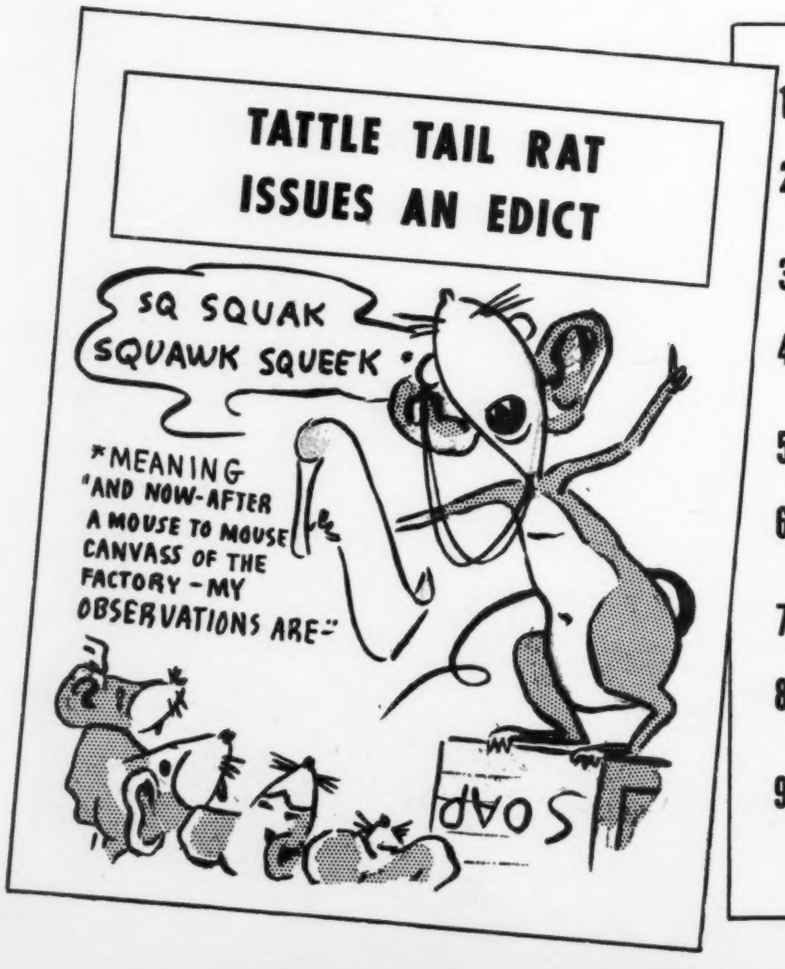
To keep the campaign alive we send out bulletins which are as humorous and different as we can make them, without losing sight of the fact that our clean-up campaign is actually serious business.

A "College" Course

We call our program "The Good Housekeeping College." Each campaign is a semester. We hand out a certificate of good housekeeping in the form of an invitation to an excellent dinner at Akron's best hotel. This helps keep up the morale.

Recently we got out a printed booklet, illustrated in two colors, describing a "Mouse-to-Mouse Canvass of Our Factory." It showed some ugly spots which we have been cleaning up. It gave the idea of clean-up a new production importance.

Pictures have helped bring home the clean-up idea. Whenever we found a situation that was altogether too bad, we took a picture, perhaps at night or on Sunday. The picture was sent to the works manager who


TATTLE TAIL RAT ISSUES AN EDICT
SQ SQUAK SQUAWK SQUEEK *
*MEANING "AND NOW-AFTER A MOUSE TO MOUSE CANVASS OF THE FACTORY - MY OBSERVATIONS ARE:-
SOAP

1. **Aisles are being kept clear — and storage spaces neat. Those aisle lines look mighty purty.**
2. **Rubbish, lunch scraps and papers are being placed in regular containers — no more choice tidbits for us.**
3. **Cuspidors are being used for spitting and cuds. No more tobacco murals on walls and in corners.**
4. **Tools, and other equipment, are being returned to their proper places. No more hurdle races over hammers, screw drivers, pliers, etc.**
5. **Notice the machines and equipment are cleaner. Some nice paint jobs are being done.**
6. **The pop and milk bottles once used for roller skates and balancing acts are now being placed in containers.**
7. **The fire blanket and stretcher boxes are neat and clean—no more nice warm beds for us this winter.**
8. **Flammable rubbish, oily waste, rags, etc. are being placed in closed containers. Not going to be any fires by which to warm ourselves.**
9. **Ground wires are installed on tables, and other equipment, where flammable solvents and cement are used. We'll miss those beautiful static fireworks displays.**

Bulletins sent every so often to "students" of "Good Housekeeping College" are all in the spirit of good, clean fun, yet contain many a healthy dig aimed at getting all to take the clean-up campaign seriously

COLLEGE GOSSIP

1. Last semester some of the professors built their dog houses so comfortable they could not get their students to leave them.

2. Some students are laying in a supply of cushion gum for posterior protec-

semester are back in the

5. Mill #4 has returned the the request it be refill

6. See the students of Pro each other visits at divisions do not pay som work?

7. A popular student at make him lift his gre department.

GOODHOUSEKEEPING COLLEGE

COMMENCEMENT EXERCISES

STUDENTS: The time has now come to bring another Semester of our Goodhousekeeping Course to a close.

THE PROFESSORS have a serious look -- beginning to look over their CLASSROOMS -- and getting ready to ask you some questions that may be difficult to answer.

EXAMINATIONS are now getting under way. Possibly you have a little time to brush up or cram. Maybe your examination will be first --- it all depends on the turn of the cards. BUT YOU HAD BETTER BE READY.

ound:

still poorly aligned (no aisle or storage lines).
inate at some locations.
dirt (drawers, cupboards, files, etc.)
ss partitions and equipment.
(especially the bases).
disorderly.
are pretty sore about some "wormy apples."

ND GOODHOUSEKEEPING HINTS WILL GIVE YOU ANSWERS TO

front door with a Cum Laude --

back door with a Cum Pede applied to the posterior?

GOODHOUSEKEEPING COMMITTEE

10. That's a nice red color freshly painted on those containers for flammable materials. Remember — Red means danger.

11. Factory people are also keeping their fire fighting equipment clear and ready for immediate use. We'll have to move fast to get out of the way.

12. Our nests will also be cold this winter — flammable articles are being moved away from hot steam lines.

13. Dust, lint, cement, etc. are being kept away from open flames, motors, lights, etc. Guess they want to freeze us — no more fires or explosion hazards.

14. Paper shades are not permitted on electric lights. We are going to need smoked glasses.

15. After a new or repair job all debris or surplus materials will be removed from the scene. Sure ruins plenty of our nests.

16. Heard many pledges to work safely — drive safely — play safely — that families and Uncle Sam needed them. Uncle Sam has a grudge against some fellows across the water — and everyone wants to help out.

Orders are herewith issued for immediate evacuation of all rats — we refuse to live under "Good Housekeeping" conditions. We will move out. (We are back in our rent anyway.)

Signed:

TATTLE TAIL RAT

Head rat's report (left) after "mouse-to-mouse" canvass gives rat's-eye view of clean-up results, orders immediate evacuation by rodents of all Goodrich buildings

in turn sent it back to the general superintendent with a polite question as to whether something couldn't be done about it. Something was always done, and promptly.

Now and then we printed a pretty bad picture in our factory magazine, "The Goodrich Circle," with the blunt question: "Is this your department?" It began to be popular and smart for the manufacturing departments to be tidy and clean.

Keeping the factory clean is not so hard now. But we still try to look at the plant with fresh eyes. That's a real assignment.

Office Cleans Up, Too

You might think that the cleaning-up would begin and end with the factory and leave the office alone. Not so. We found that some bad habits had grown up in and around the company's offices, and the clean-up was extended to them.

For instance, we found desks with drawers stuffed so full of papers that they couldn't be closed. We found piles of things stacked on top of filing cabinets. We found junk, cross-sections of tires, sample metal parts, and other odds and ends—tons of stuff. The camera and some publicity on bulletin boards and in "The Goodrich Circle" helped clean up these eyesores.

We finally adopted a sort of model set-up for any office anywhere in the Company. This calls for as few pictures as possible on the walls—no pretty-girl pictures, no high school diplomas, no trophies, no gift calendars sent out by stores and insurance agents. Instead, we issue a standard calendar, the handy three-months-at-a-glance type, with no picture and not a single line of advertising matter.

The standard office calls for desk and chairs, filing cabinet, and perhaps a bookcase. But these fixtures must be kept orderly and clean. Things go *inside* the bookcase, not on top of it.

All in all, we have been well pleased with our good housekeeping campaign. It helps us work better, and with fewer surprises and mishaps. Probably we get the day's work done with fewer delays and less spoilage to costly material because—well, the pictures show the conditions under which we used to work and the way our departments are cleaned up now. Couldn't you work better yourself in a clean factory? And wouldn't YOU prefer to work in a factory that is 85 percent clean, not just now and then, but through most of the 365 working days of the year?

What a difference a little clean-up makes! Here are typical then-and-now photographs illustrating the contrast between haphazard dropping and orderly storage of raw materials. Valuable floor space occupied by inactive items has been recovered and put back into service

Keep Arc Welders Welding

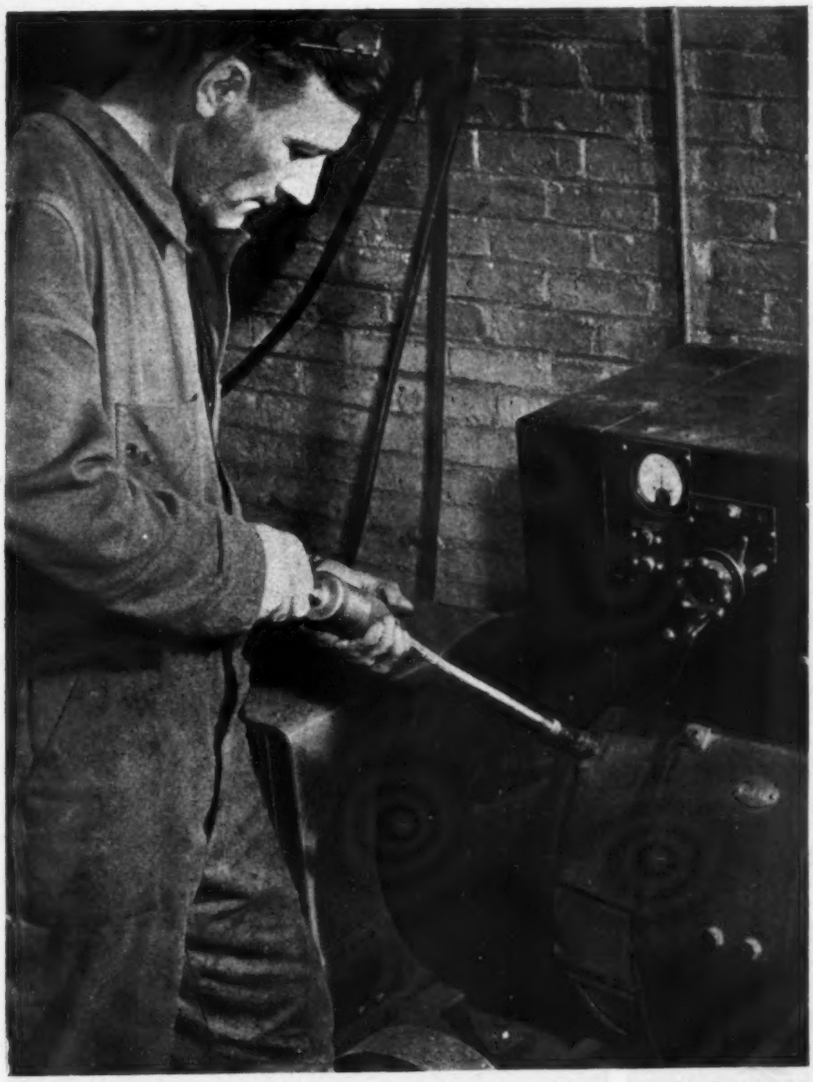
Arc welding machines are bears for punishment, but they will do better work, and do it longer, if kept in tiptop shape both mechanically and electrically

R. F. WYER, Welding Engineer, General Electric Company

SIMPLE AND RELIABLE as arc welding sets are, they require periodic maintenance attention in order to keep them in condition to give maximum service.

With accent on production in shipyards, ordnance plants, and welding shops of all types, the failure of even a few sets is sometimes costly. A systematized maintenance program will pay dividends in terms of better welder performance and longer life.

Proper choice of a single-operator set must take into account the maximum current, load voltage, and duty factor (ratio of arc time to total time). Most sets are rated on a one-hour load; their rating is the current which they will deliver continuously for the hour, without exceeding the temperature rise prescribed for them.



Always use hand-operated grease guns on pressure-relief lubricated bearings. Add grease slowly to permit excess to vent from relief pipe

Proper installation can do much to keep welding equipment at work and troubles at a minimum. Branch circuit conductors and fuse clips must be provided to accommodate the motor starting load. Therefore due consideration must be given to the starting current.

The National Electrical Code permits the use of fuses three times the motor full-load current. In general, fuses having a rating between two and three times the full-load current rating of the motor will permit starting the equipment as often as necessary in normal welding service.

Ground the frames of all welding equipment to avoid shock when a person touches the frame. With equipment in perfect operating condition, it is possible to receive a harmless sensation of shock from ungrounded machines. In addition to protecting against this annoyance, adequate grounding of machine frames is a desirable safety precaution against harm resulting from insulation failure in equipment or leads, or improper connections.

Regardless of the type of safety ground connection which is installed, adequate low-resistance work leads should always be used, and good connection between the work lead and the work secured. If this is not done, it is possible to overheat the safety ground connection by the passage of welding current through it.

In the location of welding equipment, ventilation is an important consideration. The life of electrical insulation is seriously shortened by overheating, and overheating is bound to result where insufficient ventilation is provided. Where small houses or temporary sheds containing welders are exposed to hot sunshine, the heat absorbed from the sun added to the heat dissipated by the welding equipments may raise the ambient temperature above 100 degrees Fahrenheit. Large louvers or other ventilating openings should be provided in the building at the bottom and near the roof to give good air circula-

New brushes must be carefully fitted to the commutator. Insert a strip of fine sandpaper, sand side up, between commutator and brush

tion. It may be desirable to provide exhaust fans to assist in removing heated air from the upper part of such inclosures.

It is highly desirable to keep a complete record of all welders. One of the most useful and easy-to-handle references is a card file. All repair work, with its cost, should be entered on the record, and any welder requiring excessive attention or expense ought to be investigated.

Inspection records will serve as a guide to tell when welders should be replaced because of the high cost to keep them in operating condition. Misapplications, abuses by welding operators, and the like also will be disclosed.

A systematic and periodic inspection of motors and generators is necessary to insure best operation. Most machines are located where some sort of dirt accumulates on the windings.

Some dusts are conductive; others are highly abrasive and actually cut the insulation while being carried through by the ventilating air. Fine cast-iron dust quickly penetrates most insulating materials.

If conditions are extremely severe, weekly inspection and partial clean-

Insulation resistance meters provide simple means of checking resistance of motor-generator windings

Use low-pressure air to blow dust out of welders, and thus avoid driving abrasive dust into insulation

ing are desirable. Most motors require a complete overhauling and thorough cleaning about once a year.

The motor and generator should be blown out with dry compressed air, at a pressure of 25 to 30 pounds per square inch. Where conducting and abrasive dusts are present a lower pressure may be necessary, and suction is to be preferred, because damage can easily be caused by blowing dust and metal chips into the insulation. On most motors the windings are fairly accessible and the air can be properly directed to prevent such damage.

About once a year welders should be overhauled. First, the heavy dirt and grease should be removed with a stiff brush, wooden or fiber scrapers, and cloths. Rifle cleaning bristle brushes can be used in air ducts. Dry dirt can be blown off, using dry compressed air at moderate pressure.

Grease, oil, and sticky dirt are easily removed by applying cleaning liquids such as carbon tetrachloride. There are several good methods of applying the cleansing liquid. Probably the best method is spraying. A cloth or a paint brush, dipped in carbon tetrachloride, is handy for coils and crevices. Insulation should not be soaked by dipping into the liquid.

While the insulation will dry quickly at ordinary room temperature after such cleaning methods, it is advisable to heat it to 90 or 100 degrees Centigrade. While the motor is still warm, a high-grade insulating varnish should be applied.

The varnish may be sprayed or brushed on. After applying the varnish, the best results are obtained by baking for 6 to 7 hours at about 100 degrees Centigrade. If the machine must be put back into service quickly, or if facilities are not available for baking, fairly good results will be obtained by applying a good air-drying varnish.

Manufacturers' instructions regarding lubrication of bearings should be carefully followed. Usually grease-packed bearings have sufficient lubricant, when shipped from the factory, to last about a year under normal conditions of cleanliness and temperature. When operating conditions are severe it is well to shorten the bearing inspection and lubrication interval down to six months, or less if experience warrants. An occasional check of bearing temperature by feeling with the hand may disclose undue heating before damage is actually done. Lubricating routine should be carried out by reliable men.

Amp.	Speed	Make	Connection Diagram	Application	Shop or Mill No.	Card No.

Type	Motor Voltage	Time or Duty Cycle	F.L. Amp.	Phase	Cycles

Serial No. Model No.	Publication No.	Mfr's Order No. Our Order No. Date of Order Cost

BRUSHES	COILS (Cat. or Spec. No.)		
	Motor	Generator	
No. Cat. No. Size Material Grade	Stator Main Comm. Comp.	Field Main Comm. Comp.	
BEARINGS	Rotor	Armature	
Front End, Cat. No. Motor End Cat. No.	Coils Bars No. per set	Coils Bars No. per set	User: Location:

SERVICE RECORD

Date	Shop	Floor	Service (Tacking, etc.)	Duty Factor	Tested Load	
					Volts	Amps.

REPAIRS

Date	Condition	Due to	Repaired by	Cost

MAINTENANCE

Greased		Inspected		Cleaned	
Date	By	Date	By	Date	By

This form provides ample space for a complete record of welder performance, as well as a tabulation of all pertinent machine data

Too Much Grease

The major causes of bearing troubles are overgreasing and dirt. Overgreasing results in excessive heating of the bearing, frequently in churning and breaking down of the grease with loss of its protective qualities.

Dirt occasionally gets into a bearing through the use of grease kept in uncovered containers, or through carelessness in protecting parts while bearings are disassembled or opened for inspection. Precautions that are obvious but often overlooked:

1. Every part of a bearing assembly, including retainer plates, gaskets, and screws, should be placed in a clean box immediately on removal and if they become dirty they should not be replaced without a thorough cleaning in a suitable solvent.

2. Only clean hands, tools, and rags should ever be allowed to touch a bearing.

3. Grease must be clean. If there is the slightest doubt of its purity, it should be thrown away.

Only a high grade of grease, having the following general charac-

teristics, should be used for ball bearing lubrication:

1. Consistency a little stiffer than that of vaseline, maintained over the operating temperature range.

2. Melting point preferably over 150 degrees Centigrade.

3. Freedom from separation of oil and soap under operating and storage conditions.

4. Freedom from abrasive matter, acid, and alkali.

When greasing ball-bearing motors equipped with pressure-relief systems wipe the pressure-gun fitting, bearing housing, and relief plug clean. Remove the relief plug from the bottom of the bearing before using the grease gun. This prevents putting excessive pressure inside the bearing housing, which might rupture the bearing seal.

(*Continued on page 230*)

What to Do When Arc Welders Fail to Operate Properly

TROUBLE	CAUSES	REMEDIES
Machine fails to hold heat	Rough or dirty commutator	Commutator should be trued or cleaned
	Brushes may be worn down to limit of adjustment or life	Replace or readjust brushes
	Brush springs may have lost adjustment or may be broken	Replace or readjust brush springs
	Field circuit may have variable resistance connection or intermittent open circuit	Check field current with ammeter to discover varying current
	Electrode-lead or work-lead connections may be poor	Tighten all connections
	Wrong grade of brushes may have been installed on generators	Check with manufacturer's recommendations
	Field rheostat or tap switches may be making poor contact and overheating	Inspect rheostat and clean and adjust finger tension on switches
	Brush-shifting or other mechanical current-adjusting mechanism may have loose or worn links	Check current-adjusting mechanism for backlash and play
Motor trips off line	Power circuit may be single-phased	Check for one blown fuse or dead line
	Welder may be operating above current capacity	Check load against welder nameplate. Check duty cycle
	Welding electrode or work leads may be too long or too small in cross section	Check terminal voltage while machine is loaded; it should not exceed 30 volts on small machines or 40 volts on large machines when operating at rated current
	Ambient temperature may be too high	Room temperature should not exceed 100 deg. F.; there should be no interference with normal ventilation of the machine
Machine fails to start	Power circuit may be completely dead	Look for open disconnect switch, fuses removed or blown
	Power circuit may be single-phased	Look for one blown fuse or one dead line
	Power line voltage may not be suitable for motor, or may be extremely low; may be accompanied by chattering of the starter	Check voltage with volt-meter, particularly at the moment of attempted starting
	Machine may be jammed	See that armature turns over easily by hand, and look for foreign material in air gaps
	Motor starter may be single-phased	Check to see that all fingers on starter make contact when closed
	Overload protecting relays may be tripped	See that relay contacts are closed and that starter picks up when pushbutton is pressed. Be sure to remove cause of tripping
Welder starts but fails to generate	May be running the wrong way	Check rotation with manufacturer's instructions or direction arrow. On 3-phase motors, direction of rotation may be changed by interchanging any two leads
	Generator or exciter brushes may be loose or missing	Be sure that all brushes bear on the commutator and have proper spring tension
	Exciter may not be operating	Check exciter output voltage with voltmeter or lamp
	Field circuit of generator or exciter may be open	Check for open circuits in rheostat, field leads, and field coils. Also check resistors and rectifiers, if any
	Generator may be reversed in polarity due to another machine or incorrect operation in parallel with another machine	Flash the field with a storage battery or another generator first with one polarity and then with the other to see if it builds up
	Series field and armature circuit may be open-circuited	Check circuit with ringer or voltmeter
Welding arc is loud and spatters excessively	Current setting may be too high	Check setting and current output with ammeter
	Polarity may be wrong	Check polarity
		Try reversing polarity or try an electrode of the opposite polarity

Stop Waste of Welding Gases

Demand for oxygen and acetylene is straining production facilities. Cutting out waste is essential. Here are several ways to ease a potentially serious situation

DEMAND for oxygen and acetylene gases has increased enormously. In spite of increased production, a critical situation faces producers and consumers of these gases unless efforts are made to conserve them.

The following list of recommended practices, prepared by Air Reduction Sales Company, is based upon observations of conditions in oxyacetylene welding and cutting shops.

1. *Use the Proper-Sized Torch Tip.* A No. 2 tip used instead of a No. 1 for cutting ½-in. plate consumes 10 to 20 percent more oxygen, 16 percent more acetylene—all wasted.

2. *Do Not Use Excessive Pressures.* Manufacturers' rated pressures are the most efficient for average conditions. When more speed is desired, the new high-speed machine cutting tips cut faster without additional oxygen.

3. *Close Cylinder Valves When Torch Is Not in Use.* If only the torch valves are closed, gas pressure in the hose may force leaks.

4. *Check Hose and Connections For Leaks.* A $\frac{1}{64}$-in. diameter leak in hose operating at 100 pounds will waste 290 cubic feet of oxygen in 24 hours. Check hose periodically by immersing it in water while under pressure. Soap and water will reveal leaks at connections.

5. *Use Correct Diameter Hose.* Hose that is too small for the job requires higher gage pressure to secure sufficient flow, causing unnecessary strain and promoting leakage.

6. *Use Short Lengths of Hose.* Unnecessarily long hose requires higher pressure to overcome pressure drop. Also, the surplus lengths are subjected to unnecessary wear and tear.

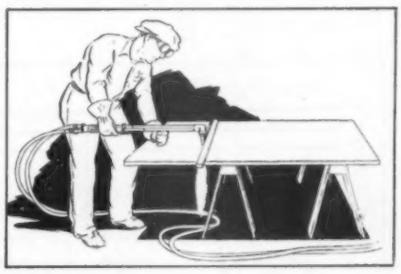
7. *Use All the Gas in Each Cylinder.* Use every cylinder for all it is worth before disconnecting it. Interruptions to change tanks can be avoided by manifolding gas cylinders, or by installing pipe lines.

8. *Keep Cylinder Inventories Low.* Gas suppliers are cooperating by providing frequent deliveries. You can help by ordering fewer cylinders oftener, and by keeping reserves of cylinders at a minimum.

9. *Return Empty Cylinders Promptly.* Idle cylinders are slackers.

10. *Don't Leave Torches Burning When Not in Use.* If the torch burns idly for three minutes out of each hour, it is wasting 5 percent of its gas consumption.

11. *Keep Tips Clean and Free From Carbon and Slag.* An unclean tip is inefficient. Congested orifices nullify the value of using proper pressures and speeds, result in lower efficiency and waste of gas.



12. *Don't Abuse Cylinders.* A damaged cylinder contributes nothing while undergoing repairs.

13. *Handle Hose With Care.* Keep hose out of range of hot oxide and sparks; wash off oil and grease, which ruin rubber; place a plank on each side of the hose where it crosses truck runways; store hose stocks in a cool, dark place; when a hose is damaged cut out the bad portion and splice the ends with standard nipples.

Transformer Connections Can Work for You

Transformer connections may frequently supply that "other" needed voltage, or lighting service, from a power bank at maximum effectiveness and minimum cost

T. J. WOTH, Industrial Engineer, Westinghouse Electric & Manufacturing Company, Atlanta

TRANSFORMER CONNECTIONS can be varied more than is sometimes realized, in order to meet requirements. Each scheme of connection provides certain characteristics, or advantages, and may impose some disadvantages.

Most industrial plants require two electrical distribution systems: First, a well-regulated 120/240-volt, single-phase, three-wire system to supply the lighting load; second, a 240-, 460-, or 575-volt, three-phase system for power. The most economical arrangement of circuits and transformer connections for supplying these two systems depends somewhat upon the relative demand for light and power, type of operation, and plant layout.

Where maximum power and light demand does not exceed 400 or 500 kva., it is common practice to use standard distribution transformers, connected as shown in Figure 1. Three transformers of the proper rating, connected delta-delta, provide a three-phase ungrounded supply for power load, and a single transformer connected across one phase of the primary circuit provides single-phase grounded-neutral supply for lighting. This arrangement is probably the simplest and most desirable, since the ratings of the individual transformers can be determined and applied accurately to the two types of load.

Keeping the two circuits isolated is desirable to avoid excessive voltage fluctuations and objectionable flicker on the lighting circuits. Use of a separate transformer for the lighting circuit means that the latter will be almost free from voltage disturbances caused by widely changing power loads or by starting large motors. Uniform voltage is particularly important where good lighting is essential or where fluorescent lamps are now being used or considered for future extensions. Unless the voltage is regulated, it may become necessary to install separate automatically operated induction regulators to hold voltage on lighting circuits within more desirable operating limits.

Three-Phase Four-Wire Delta. In plants where 240-volt, three-phase power is used, it is possible to supply both power and light feeders from a single delta-delta-connected transformer bank. This connection is referred to as the three-phase, four-wire delta and usually results in some saving in first cost of transformers, but it also has some disadvantages, which should be carefully considered before it is adopted for general use.

Figure 2 shows connections for a delta-delta bank arranged to supply 240-volt, three-phase power and 120/240-volt, three-wire lighting service. All three transformers can be standard distribution units with two-part secondaries, which makes the midpoint available for three-wire service and for grounding. Only the neutral of the transformer used to supply the lighting load should be connected to ground. Thus the three-phase power circuit, as well as the lighting circuit, must be treated as a "grounded circuit," and all three-phase motor starters must be provided with three thermal or magnetic overload devices to prevent service interruptions by motor or control trouble. Special or more expensive motor control must be used

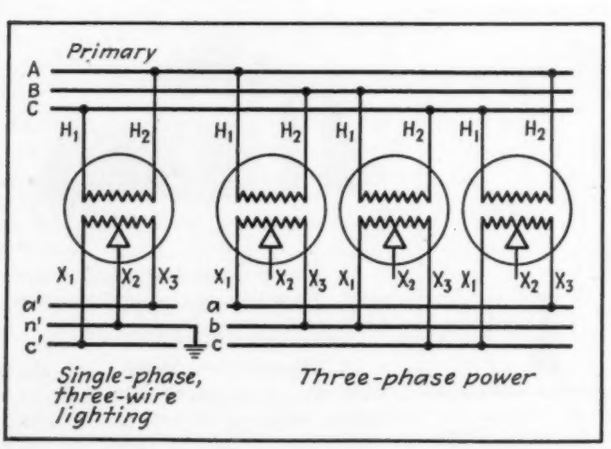


Figure 1. This method of connecting transformers to supply lighting and power circuits is widely used. Transformers have subtractive polarity, are connected delta-delta, and are readily changeable

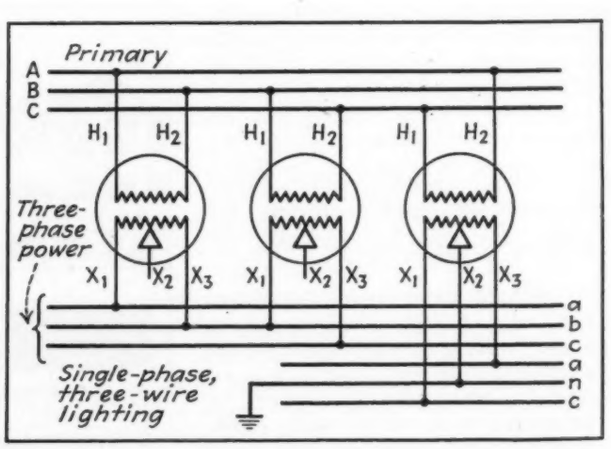


Figure 2. Here a delta-delta connected bank of single-phase transformers provides three-phase power and single-phase, three-wire lighting service. Polarity is subtractive, and the bank is grounded

"Damn the torpedoes! ... full speed ahead!"

WHEN FARRAGUT stormed into Mobile Bay, his was a stirring watchword. "Damn the torpedoes! Full speed ahead!" Those are fighting words . . . to set the pace for a fighting nation.

And in every mine, factory, mill, or industrial plant, Farragut's cry must be remembered. Damn the *difficulties!* Full speed ahead! America needs ores, minerals, and armament. Our men at the fighting front must lay down a curtain of fire against a determined and treacherous foe. From now until final Victory dawns . . . we'll keep going at full speed to help *Keep America Rolling.*

Exide
IRONCLAD
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

in any plant where the four-wire delta system is used, which partly or entirely offsets any small saving in first cost of the transformers.

Three-Phase Four-Wire Open Delta. If the ratio of power to lighting load is large, all three transformers can be of the same rating, and all units are interchangeable. If the power requirements are small in comparison to the lighting demand, however, it becomes necessary to use a larger transformer in combination with two smaller units. The three units then have dissimilar characteristics, resulting in the possibility of circulating currents as well as the unequal division of the loads.

Ordinarily these circulating currents are not serious, and overloading can be prevented by allowing a liberal margin between actual load and the capacity of the various transformers. It is, however, undesirable to use this arrangement whenever the capacity of the lighting transformer exceeds twice the individual rating of the other two transformers. Where the lighting transformer is excessively large, it becomes more desirable to use the four-wire open-delta connection shown in Figure 3, thus avoiding the possibility of excessive load unbalance and dangerous circulating current.

Three-Phase Interconnected Delta. Many uses can be found for the interconnected delta system as shown in Figure 4. Ordinarily this arrangement is used to supply three-phase circuits at two different voltages, such as 120 and 240 volts or 240 and 480 volts. The same arrangement can be used on the primary side of the transformer, provided, of course, that the primary is arranged for series-parallel connection and that the third high-voltage bushing can be installed. This connection offers a convenient and inexpensive way to increase feeder capacity between various points by increasing voltage from 2400 to 4800 volts. Operating the feeder at a higher voltage increases the kva.-carrying capacity in a ratio proportional to the squares of the voltages. In other words, increasing the voltage from 2400 to 4800 volts means that four times the load can be carried with the same voltage drop. Care must be exercised in using this arrangement, however, to avoid overloading the transformers and causing failure or burnout.

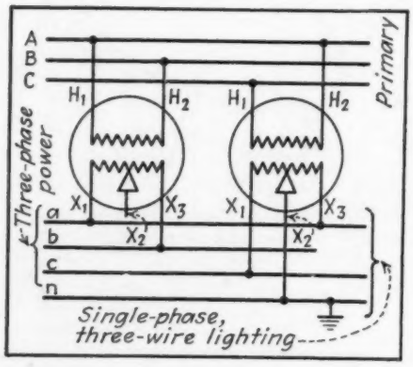


Figure 3. This two-transformer open-delta, four-wire secondary bank supplies three-phase power and single-phase, three-wire lighting. Polarity is subtractive

Figure 5 indicates the approximate load that can be carried on the low-voltage delta for various percentages of load on the full-voltage delta connection, without exceeding a safe total load. It will be noticed that a maximum of 50 percent of the bank capacity can be obtained from the low-voltage delta with no load on the other winding. As the percentage load on the full voltage is increased, a proportionately smaller amount of load can be carried on the low-voltage delta.

Three-Phase Four-Wire Network. The three-phase, four-wire secondary connection was primarily developed for use with a low-voltage secondary network system. Its use has proved to be advantageous also in supplying small, isolated radial systems. This system has several advantages over the three-phase, four-wire delta system since, regardless of the ratio of power to lighting load, identical transformers can be used on all three phases. Lighting as well as three-phase power loads can be well balanced among the three transformers.

Both of these circuits have a common ground connection which maintains a symmetrical and balanced voltage to ground on all three phases. In addition to these features, certain economies are possible in laying out feeder circuits. Only one set of main feeders, consisting of three insulated conductors and one neutral, is required, and the lighting and power loads can be taken off wherever it is desirable to do so.

The same general arrangement can be used, as shown in Figure 6, to obtain several different three-phase voltages, such as 208 and 416 volts as well as three single-phase 120 volt lighting circuits. Each circuit connects to one phase wire and the neutral.

Parallel Operation. To obtain satisfactory parallel operation between two or more transformer banks, it is essential that all transformers have similar electrical characteristics; that is, they should have the same percentage of resistance and the same ratio of turns in order to divide the load properly and prevent circulating current. It is also desirable that the units have the same polarity, although this is not essential since the connections can be arranged to correct any differences in polarity. Most of the smaller distribution transformers, 200 kva. and less, are designed for "additive" polarity, and the larger units are designed for "subtractive" polarity. It is desirable to be familiar with proper connections for both types so that either can be properly connected to give a zero phase displacement between the primary and secondary windings.

The commonly used delta connection shown in Figure 1 is proper only

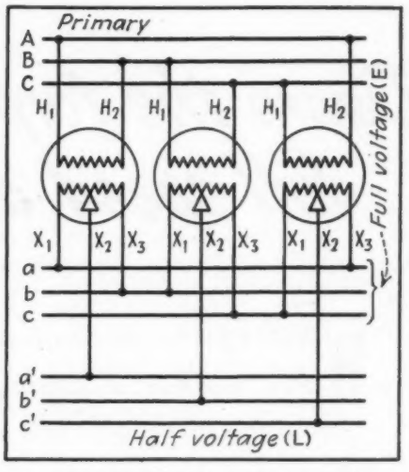


Figure 4. Two voltages, both three-phase, are available from this interconnected delta system. The low-voltage is one-half the full voltage; capacity is variable

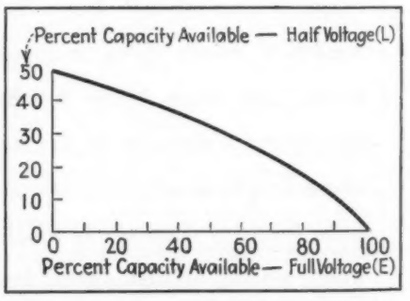
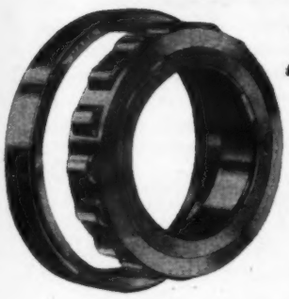


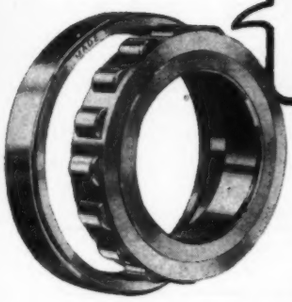
Figure 5. Curve showing the relative kva. capacities available on the low-voltage and full-voltage circuits of the interconnected delta shown in Figure 4

Said 1942 to 1892



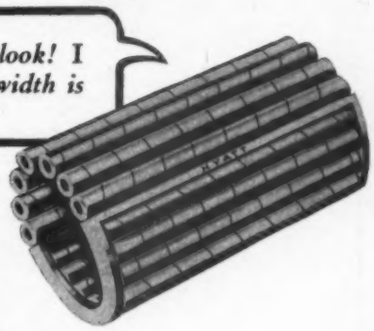
1942: *Hi, Old Timer!*

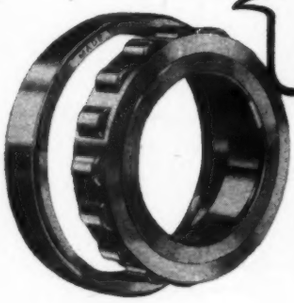
1892: *A little more respect, please. I'm the daddy of our great line of Hyatt Bearings! With a tolerance of .010 in my wound roller diameters I was the Number One bearing of my day!*



1942: *Okay Dad, but with my modern design and close tolerance of one ten-thousandth of an inch, I'm the "fair-haired boy" today.*

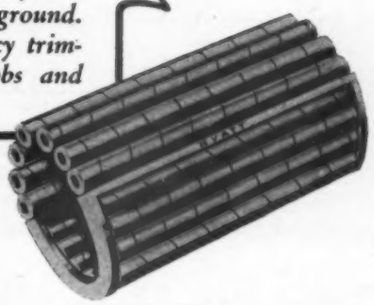
1892: *Hmph! But how skinny you look! I had a width of 6-7 inches while your width is only 1-1½ inches, young fellow.*

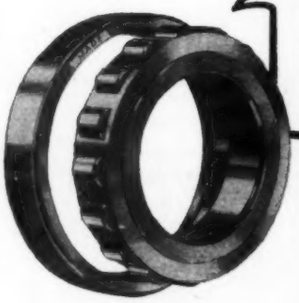




1942: *I'm streamlined, old man, but what capacity I possess. And I'm a pretty slick article with my inner and outer race, and my ultra finish.*

1892: *I know . . . I've watched you develop over fifty years. Sure I was made of only low carbon steel and my finish wasn't even ground. In my day, we didn't have all the fancy trimmings—but we handled the tough jobs and handled them well!*





1942: *I appreciate all that, old fellow, but think how out-of-place you would be today with that crude half-spacer roller retainment as compared to my swanky bronze cage and microscopically finished solid rollers and races.*

1892-1942: *You're right, lad. But look me over now. Other than in roller design I've changed considerably during these years. And I'm still in there pitching with you where applications call for my lubrication features and shock load advantages. So—give credit where credit is due!*

THE 50TH YEAR OF

HYATT ROLLER BEARINGS

HYATT BEARINGS DIVISION, GENERAL MOTORS CORPORATION, HARRISON, NEW JERSEY

for transformers that have subtractive polarity. If the transformers with additive polarity are connected in this manner, they will have 180-deg. phase displacement between primary and secondary windings. If they are connected as shown in Figure 7, phase displacement is zero, and the banks can be operated in parallel with units of subtractive polarity. Figure 8 shows the proper connections to obtain zero phase displacement between primary and secondary when three single-phase units of either additive or subtractive polarity are to be connected for delta-star operation.

Single-Phase Versus Three-Phase Transformers. The practice of using one large bank of outdoor single-phase transformers to supply industrial plants is rapidly becoming economically obsolete because of the development of air-cooled and non-flammable liquid-cooled transformers. These units are available up to 1000 kva., three-phase, 13,200 volts and make it possible to install a number of complete three-phase substation units at strategic load centers directly on the manufacturing floor. A saving in the cost of the low-voltage distribution system usually results because length of cable runs can be reduced to a minimum with a corresponding reduction in feeder losses, and improved voltage regulation.

The practice of installing one large outdoor bank of single-phase transformers was dictated primarily by the fact that transformers were available only in oil-filled units, making it not only expensive but also hazardous to locate them near the actual load center. However, air-cooled units eliminate all explosion and fire hazards since they are constructed entirely from non-combustible materials. By installing relatively small three-phase units, completely assembled with primary fuses and secondary air breakers, a minimum amount of factory floor space is required. Usually all the units can be of similar design, thereby requiring a minimum investment in standby or spare capacity, which can either be in the form of one complete spare transformer unit, or tie-cables between adjacent transformer units. This arrangement provides maximum continuity of service because complete interruption of service can result only from failure of the main primary source of supply.

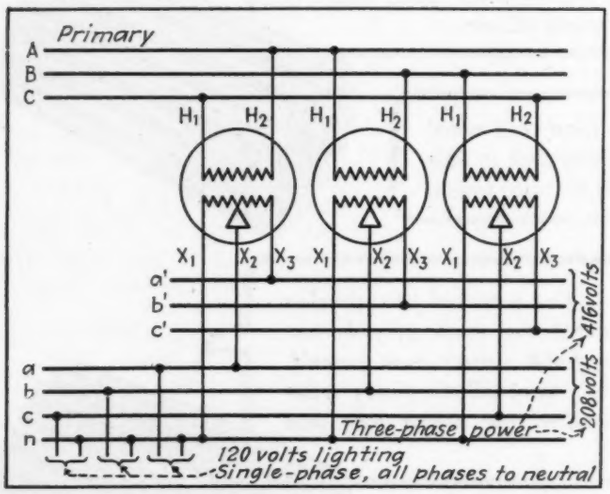


Figure 6. A delta-star system yields two three-phase voltages in addition to single-phase lighting from each of the three phase wires and neutral

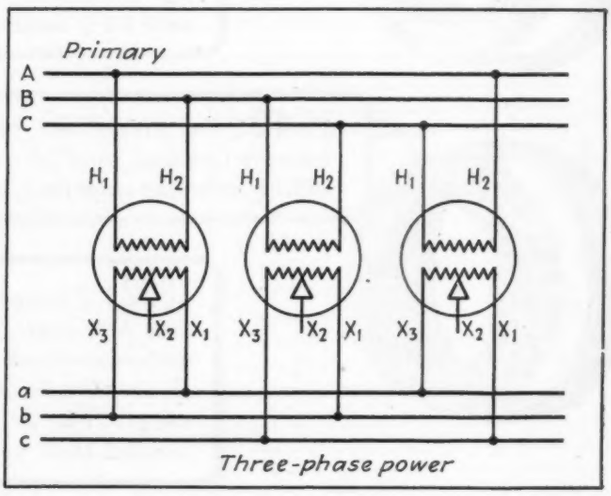


Figure 7. A delta-connected three-phase bank using transformers with additive polarity. Note differences in transformer terminal identification

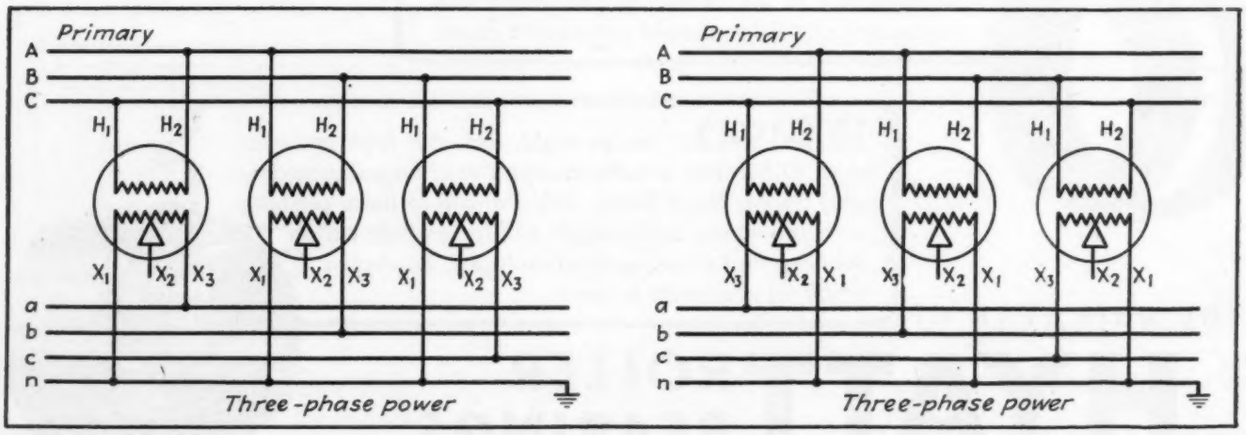
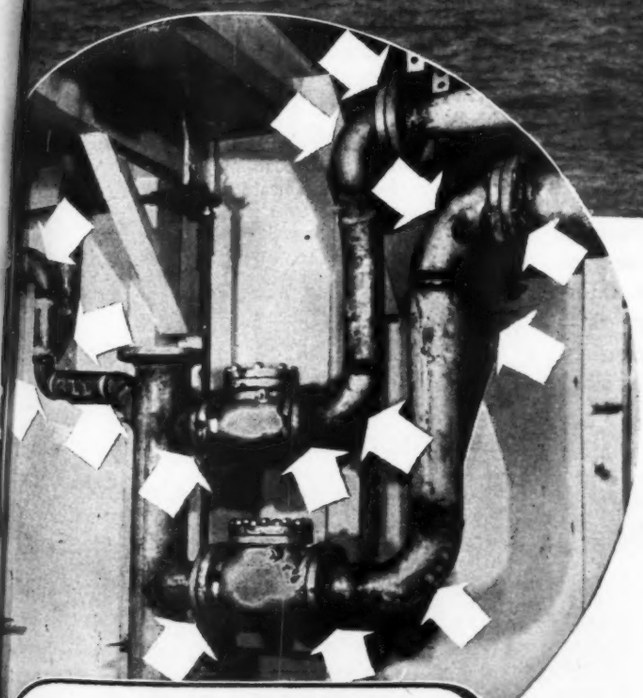


Figure 8. Delta-star connections for three-phase power bank using transformers with subtractive and additive polarity. The left-hand bank is subtractive polarity, while the right-hand bank is additive

There are no "spills" at piping turns when TUBE-TURN fittings are on the job!



In this small area are *fifteen* places where Tube-Turn welding fittings and flanges are on the job—giving full protection against leakage and other maintenance worries. In any complete piping system, figure the hundreds of points where flow direction changes, and you'll see why Tube-Turn returns, elbows, tees, reducers, laterals, nipples, caps and flanges offer extra protection and trouble-free piping.

Disaster at the turns is an old story—

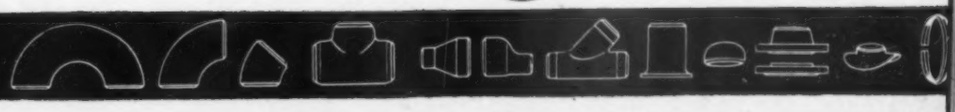
With spray flying and motors roaring, speed boats hurtle around the buoy-marked racing turns at break-neck speed! Cutting the curves too sharp or too fast means an upset—another case of failure at the turns.

The same danger lies at turns in *piping systems.* Wherever there is a change in flow direction, the strain imposed by the flow speed and pressure increases the probability of leakage and failure unless they're *welded* and *protected* with Tube-Turn welding fittings!

Write for helpful Tube-Turn data book and catalog.

TUBE-TURNS, INC., Louisville, Ky. *Branch offices:* New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Tulsa, Houston, Los Angeels. *Distributors in all principal cities.*

TUBE-TURN TRADE MARK — The FIRST WELDING FITTINGS 1ST AND STILL THE BEST — *Welding Fittings*



MAINTENANCE SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary maintenance accomplishments. Accepted articles will be paid for

Capacitors Pay Out in Eighteen Months

SOURCE—Westinghouse Electric & Manufacturing Company, East Pittsburgh

It took exactly eighteen months for capacitors installed in the plant of Sumter Wood Products Company, Sumter, S. C., to pay for themselves. The total connected plant load of 1412 horsepower is made up of 220-volt induction motors driving woodworking machinery. Part of the power requirement is supplied by local generation.

By installing 26 3-phase, 7½-kva. capacitors at individual motors, power factor was increased from 0.66 to 0.88. This improvement in system power factor resulted in a yearly saving of approximately $2000. Initial cost of installation was around $3000.

Through reduction of reactive power, feeder current in the plant has been reduced and voltage regulation has been improved.

These 7½-kva. capacitors are part of an installation of 26 units that raised power factor from 0.66 to 0.88, pay for themselves every 18 months

•

Power-Driven Hand Lawnmower

NORMAN C. MULLER, Oberlin, Ohio

The lawn and yards around our shop and substations are terribly rough, and in most cases too small to permit operation of a power mower.

We removed the small gears on the reel of our lawn mower and placed a V-pulley on one side. We extended the shaft on this side so as to set the wheel out 1½ inches, to clear the pulley. Then we drove the pulley with a ¼-hp. motor mounted on the handle shaft as shown.

The belt ratio is 3 to 1, and the extension cord is 150 feet long.

When using this lawnmower we found it advisable to wear goggles.

•

To cut installation time and expense to a minimum in putting in power cables, a midwest plant used a varnished-cambric, interlocked-armor cable that permits right-angle runs without use of conduits or elbows. The interlocked-armor covering acts as a ground, protects workers against shock, and provides mechanical protection to the cable.

•

White Cement Floors Reflect Light Up

White floors are an innovation in some recently built aircraft plants and may well find use in other plants where a light-reflective floor will aid assembly or other operations.

In one well-known plant the white floor surface is a 1.2½ mix of clean, white silica sand and white cement, to which a hardener is added. It was poured monolithic with the 5½-in. gray concrete base as soon as the latter had begun to harden, but before it had taken its final set. The mortar was struck off to specified ¾-in. thickness, as soon as possible after placing, with wood templets pulled along pipe screeds supported with their tops at finished floor level. After the white topping was struck off, the pipe screeds were removed. When the white mortar had hardened sufficiently it was finished, first, by using a gasoline-powered machine with three rotating trowel blades, and, finally, by hand floats.

Curing operations involved the application by spraying, of two coats of a colorless solution of sodium silicate and water (1 part sodium silicate to 4 parts water), the first coat being allowed to dry thoroughly before the second coat was sprayed on the floor.

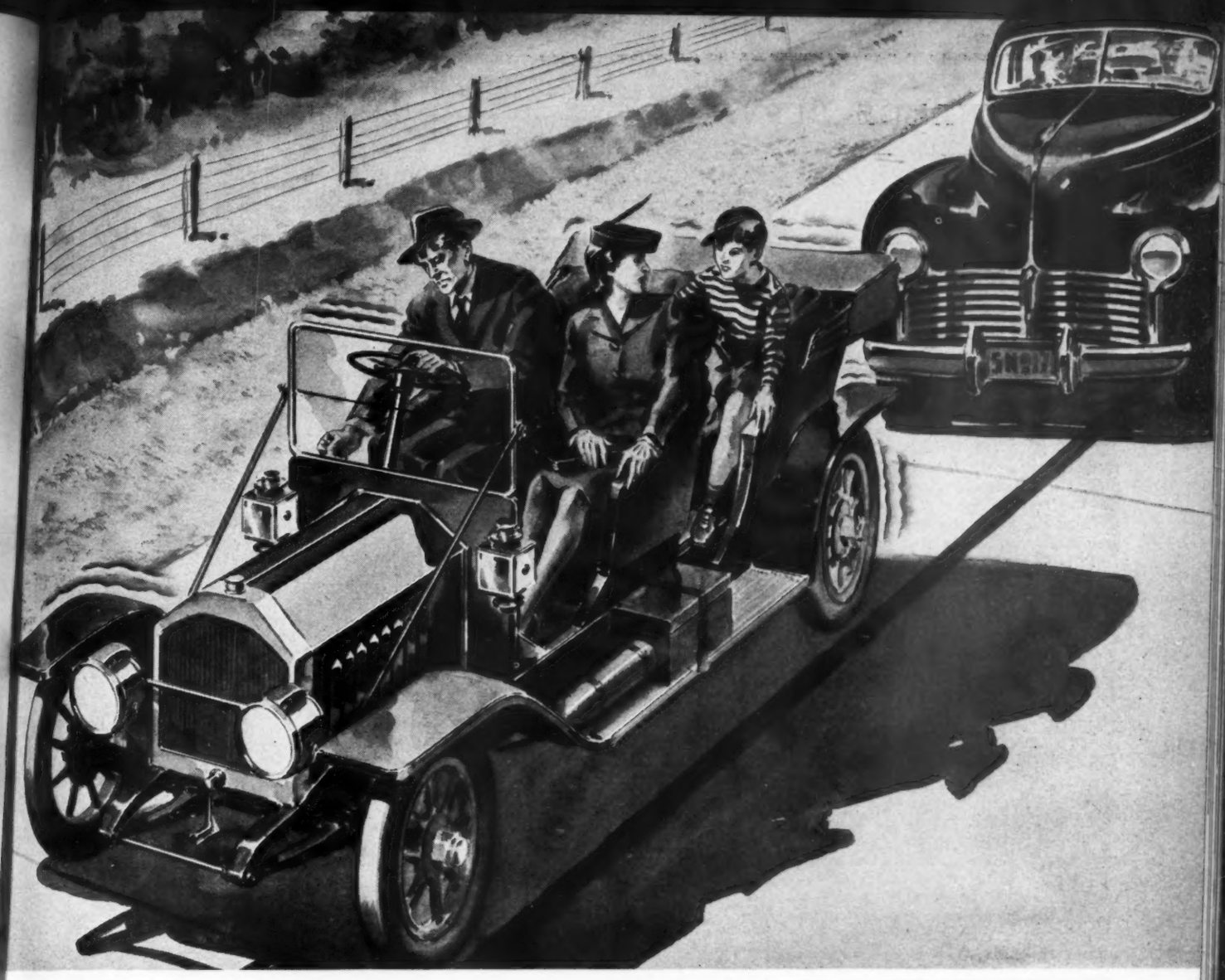
•

A Little Corrosion Made Operation Erratic

LIONEL A. HUNT, St. Catharines, Ontario, Canada.

When equipment actually breaks down or a serious defect appears, there is usually little question as to the nature of the trouble and how to remedy it. Abnormal conditions that are just serious enough to cause erratic operation or occasional stoppage, however, can often be found only by careful inspection and testing.

Such was the case with an installation of d.c. elevators supplied from a motor-



SCALES Grow Obsolete, TOO!

The application of Fairbanks Scales to weighing problems is vastly extended by the use of photo-electric cells, automatic printing devices, limit switches, and other electric control mechanisms.

Scales without modern features may be as unsuited to your *present* needs as the car you bought thirty years ago . . . may be needlessly retarding production and increasing costs.

For scales have acquired amazing new abilities. They weigh even while materials are on the move. At the touch of a button they print weight records far faster than a man can read and write them . . . and without the inevitable human errors. They count small parts and products. They weigh and disburse preset amounts automatically, and can keep ingredient proportions secret!

Let Us Help You

Fairbanks Scale engineers are thoroughly familiar with the application of improved scales to today's industrial methods and processes. Perhaps they could suggest modernizations which would prepare your present scales to serve you more efficiently, or uses in which specialized new scales would swiftly repay their cost. Write Fairbanks, Morse & Co., Dept. F31, 600 S. Michigan Ave., Chicago. Branches and service stations throughout the United States and Canada.

FAIRBANKS·MORSE SCALES

DIESEL ENGINES ELECTRICAL MACHINERY MAGNETOS RAILROAD EQUIPMENT WASHERS-IRONERS STOKERS
PUMPS MOTORS FAIRBANKS SCALES WATER SYSTEMS FARM EQUIPMENT AIR CONDITIONERS

generator set. Complaint was made that once or twice a week the motor-generator set refused to build up voltage in the morning, although in each instance it had been operating satisfactorily when shut down the night before. The generator of the set was compound-wound, and the operator could get it to build up voltage only by momentarily shorting the terminals.

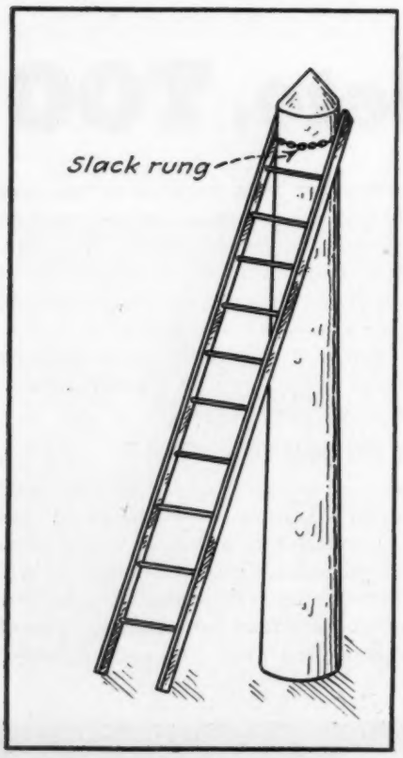
It was eventually found that the trouble was due to a corroded connection on the field rheostat behind the switchboard. The initial voltage generated from the residual magnetism occasionally was insufficient to drive enough current across this high-resistance joint to allow the field to build up. After the line voltage was established, the set operated satisfactorily. Peculiarly enough, the initial voltage usualy broke down the high-resistance film at the corroded joint, but failed to do so often enough to be troublesome and indicate that something was wrong.

•

Slack Rung Ladder More Stable

S. H. COLEMAN, Roanoke, Va.

Ladders placed against poles of electrical distribution systems, vertical pipelines, and other circular structures of relatively small diameter are usually unstable because of the limited contact area afforded the top rung by the curved surface of the supporting structure. This is especially true when the ladder side tips do not rest on the pole but project beyond it.



One way to prevent shifting and wobbling is to fasten a slack, flexible rung above the top rung of the ladder. Made of rope, chain, leather belting, or the like, the rung will hug the surface and distribute the load over a wide arc.

•

Special Form Saves Time for Repair Men

SOURCE — Stewart-Warner Corporation, Chicago

We use a special job notice form in our electrical department when trouble reports come in from various sections of the plant. It is filled out to show what electrical equipment is in trouble and where it is located. When it is handed to an electrician, he looks it over, to find out what tools he will need, and goes off to remedy the trouble.

These notices save considerable time for the repair men because they enable the men to pick out the proper tools and supplies, before they start out. Also, the men know exactly where to go, which is an important matter in a large plant.

JOB NOTICE	
Dept.	
Bldg.	
Floor	
Bay	
Motor	
Mach.	
Light	
Fuse	
Office	
Welder	
Oven	

For reporting jobs

•

Simple Device Winds Wire Resistors

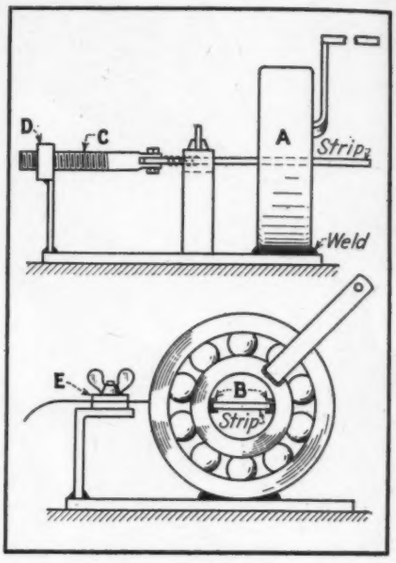
ED SWAN, Kearney, Neb.

Necessity of making some resistors confronted us with the problem of winding and spacing bare resistance wire on asbestos strips, and securing the wire to the strips. This problem was solved nicely with the machine shown in the drawing.

First a large ball bearing, *A*, was secured and welded to an iron baseplate. Guides, *B-B*, for holding and turning the asbestos strips were welded inside the ball bearing. These guides are large enough to allow a strip to slip through as it is pulled by the threaded bolt, *C*, which is a free fit in the split nut, *D*. This bolt was slotted at one end to hold the strips, which were kept in place by a small bolt.

The resistance wire was fastened to the strips by riveting. Tension was put on the wire by the fiber blocks, *E*, adjusted by a wing nut and bolt.

As the strips were rotated by turning the crank welded to the inner race of the



ball bearing, they were pulled forward by the threaded bolt and the wire spaced on them. This bolt should be selected to suit the wire size to be used or the spacing wanted.

The wire was secured to the strip by applying porcelain paste and riveting ends with hollow rivets and connecting lugs.

•

Visual Check for Loose Nuts

FRANK V. FAULHABER, Brooklyn, N. Y.

Nuts, stud bolts, and machine screws are highly useful devices for holding all manner of parts together, but they may loosen up under the vibration to which most machinery is subjected. When this happens, various kinds of trouble may result.

Testing with a wrench or screwdriver is the surest way to find out whether nuts or screws have become loose, but it takes time. A visual check, which should be supplemented at safe intervals by applying wrench or screwdriver, can be provided by lining up nuts, say, so that the sides are parallel with each other, or with some edge or other guide. If a nut loosens it can then be spotted at a glance, because it will be out of alignment.

The MISSING MAN . . .

Blame his ILLNESS for this annual loss: the time to build 164,000 TANKS!

YOUR COMPANY could do an extra week's work each year—but for illness.

Reports of the U.S. Public Health Service show that illness keeps workers off the job an average of 7 days each year. Over half of this loss is due to colds and their complications, other studies reveal.

Absences were cut in 92% of the companies which instituted health programs, it was found in the Industrial Health Practices survey of the National Association of Manufacturers. Planned, hygienic washrooms and individual tissue towels help check the spread of communicable illness.

This year, half again as many workers as last year are protected by "Soft-Tuff" ScotTissue Towels. When wet, a "Soft-Tuff" towel has *10 times more rub strength* than previous ScotTissue Towels. Yet it is soft as ever. One "Soft-Tuff" towel does a complete drying job, cuts washroom waste.

Join the "WAR ON WASTE"

The Scott *Washroom Advisory Service* offers your company a program for conserving supplies and increasing washroom efficiency, at the same time improving hygiene and comfort. Write Scott Paper Co., Chester, Pa.

Trade Marks "ScotTissue," "Soft-Tuff," "Washroom Advisory Service" Reg. U. S. Pat. Off.

INDIVIDUAL...SANITARY
STAY TOUGH WHEN WET

Soft-Tuff ScotTissue TOWELS

LEAN, savage warbirds . . .

60 thousand in 1942 . . .

125 thousand in 1943 . . .

That is America's promise to the Victory Program—and America is going to beat that promise.

It calls for new construction at record-breaking speeds . . . mile-long bomber plants, the largest in the world.

Heating problems presented by the new building program depend for their solution on the heating lessons learned in peace-time.

Fifty years of experience taught America the practical economy of Webster Systems of Steam Heating. Built around all the natural advantages of steam as a heating medium—flexibility, speed, safety. Used successfully in more than 75,000 buildings.

That is why architects, engineers and heating contractors working on war construction depend on Webster Systems of Steam Heating.

While Ordnance production has the first call on our facilities, we are working day and night to make sure that Webster Steam Heating Equipment is available for use wherever it will help the war effort.

Let our experience serve you now.

Warren Webster & Company, Camden, N. J.
Representatives in 65 principal Cities

Webster
Steam Heating

YOU WANT TO KNOW

more about the items mentioned on this page

Letters to the addresses given will bring information

• CHRONOLOGICAL STATEMENT of more important events relating to the labor situation at Federal Shipbuilding and Dry Dock Company, Kearny, N. J., has been set forth in a 181-page book prepared for the information of those who may be interested in the factual history of that union-security case, and the "directive order" of the National War Labor Board that a so-called "maintenance of membership" provision be inserted in the new labor contract to be entered into between the company and the union.

• SYNTHETIC RUBBER THREAD developed from Ameripol is said to compare favorably in elasticity with natural rubber thread, to have greater resistance to dyeing, bleaching, body oils, and to cutting by knitting-machine needles. Available for military use only—e.g., harnesses for parachutes, gas masks, respirators. The B. F. Goodrich Co., Akron, Ohio.

• ENGINEERS employing wire in designs and specifications will find much use for a handy wire data card which tabulates diameters for gage sizes 1 to 50, feet per pound for each size of standard 5 percent phosphor bronze, and conversion factors for obtaining feet per pound values for 15 other wire materials. Callite Tungsten Corp., Wire Div., Union City, N. J.

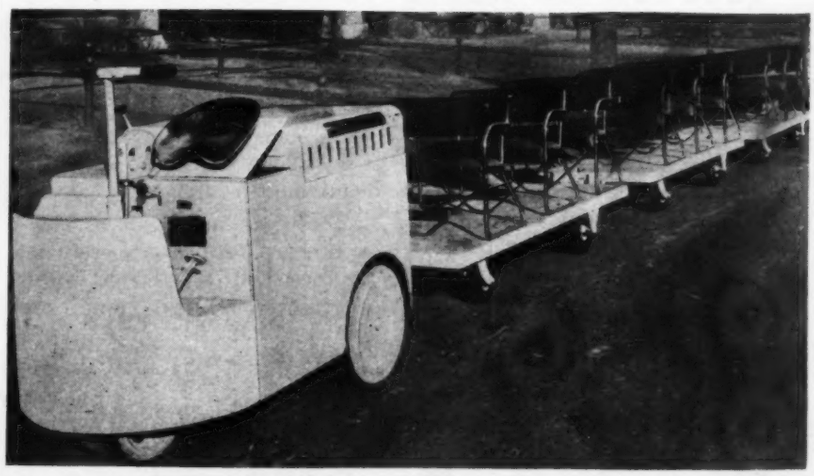
• AUTOMATIC chemical sprinkler system developed to take care of special fire hazards—near furnaces, oil burners, boilers, in storage rooms—employs a liquid which vaporizes on contact with flame and heat and thus smothers many types of fires including magnesium fires. Large systems for plants with meager water supplies can be supplied. Bancroft Chemical Sprinkler Co., 82 Foster St., Worcester, Mass.

• IF YOU ARE TRYING to work out a satisfactory scheme for increasing employee participation in the payroll savings plan of buying bonds, you will be interested in Case History No. 1 prepared by Defense Savings Staff, Treasury Department, Washington, D. C. It outlines General Electric's successful drive in its 30 large and small factories throughout the country.

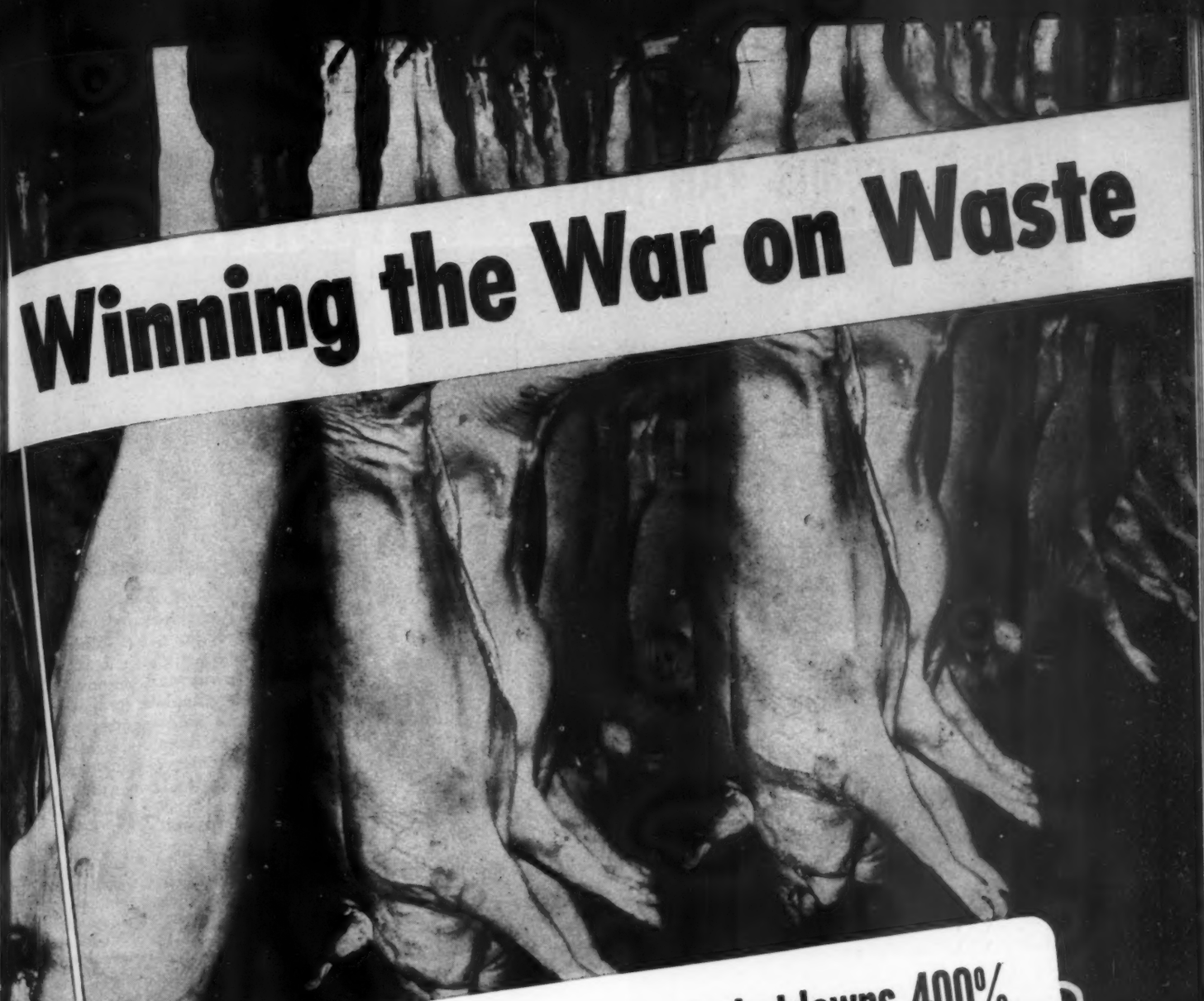
• CLARITY and permanence of color are claimed for a combination stain and filler prepared for use under varnish finishes by wood product manufacturers. Staining and filling are done in one operation with a drying time of five hours, it is said. The Glidden Co., 11001 Madison Ave., Cleveland.

• INSPIRING TALK on the engineering profession, what it is, what it stands for today, what its responsibilities are both socially and industrially, is available in pamphlet form under the title, "The Second Mile." The address was made before The Engineering Institute of Canada. Engineers' Council for Professional Development, Engineering Societies Building, 29 West 39th St., New York.

• DOCUMENTS on the union-management dispute at Walker-Turner Company, New Jersey, concerning union security, wages, and grievance machinery are set forth in a pamphlet outlining the order of the National War Labor Board in its first action of this kind; the concurring and dissenting opinions of the



TRACTOR-TRAILER COMBINATION provides a ready solution to the problem of employee transportation within large plants. Electrically powered, the tractor spreads no gas fumes and creates no fire hazard as it travels about. Sections are coupled. The Mercury Mfg. Co., 4110 South Halsted St., Chicago



Winning the War on Waste

SOLNUS OILS reduce diesel shutdowns 400% step-up efficiency in large cold storage plant

The place . . . a cold storage plant handling great quantities of perishables . . . operating four diesel engines and many compressors, pumps, etc.

The problem . . . rapid formation of hard carbon, dirty valves, clogged filters, too frequent cleaning, too much down time and maintenance.

The solution . . . Solnus Oils, recommended by Sun Oil Engineers — those capable "Doctors of Industry."

The results . . . diesels now operate four times longer between inspections . . . hard carbon troubles eliminated . . . labor and replacement of parts saved.

That's a typical case as solved by Sun's Doctors of Industry . . . typical of the service that is yours to use in your plant. These skilled technical men are ready, willing, and able to help you improve production and the products they have to offer have been developed to maintain that improved production. For proof of what Sun Service has and can accomplish write for your copy of "Helping Industry Help America."

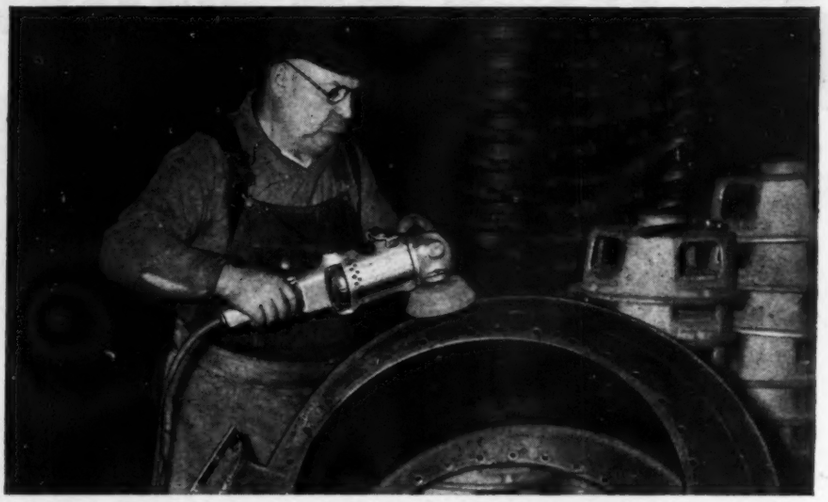
SUN OIL COMPANY—Philadelphia

Sponsors of the Sunoco News Voice of the Air—Lowell Thomas

SUNOCO

SUN PETROLEUM PRODUCTS.. HELPING INDUSTRY HELP AMERICA

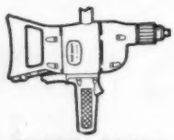
"Rush" means VAN DORN Tools



on YOUR Wartime Jobs

AS you study your war-production line to get top speed in every operation, remember this: Van Dorn Electric Tools give you over 100 different models for every kind of production job. Drills, grinders, sanders, shears, screw drivers and nut runners—every tool is powered to the job, designed to handle work speedily, built tough for tough going.

Your Van Dorn Jobber is a mine of information for you. He is a specialist in applying the right electric tool to the job. He supplies Van Dorn Tools in a hurry. He is backed by the largest coast-to-coast system of Factory-owned Service Branches in the industry, for speedy tool repairs — to prevent costly delays. Call him, or write for information to The Van Dorn Electric Tool Co., 719 Joppa Road, Towson, Md.



ELECTRIC DRILLS

LECTRO-SHEARS

BENCH GRINDERS

"Van Dorn"

(DIV. OF BLACK & DECKER MFG. CO.)

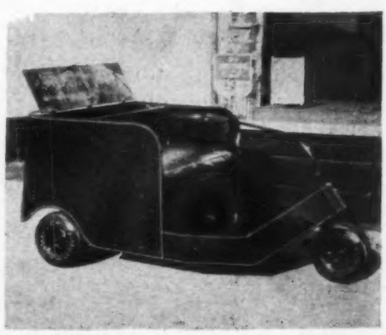
PORTABLE ELECTRIC TOOLS

public, labor, and employer members of the Board; and the statement of the company. Chamber of Commerce of the United States, Washington, D. C.

VICTORY SASH uses wood instead of steel and so enables architects, engineers, contractors, and others working on war construction to conserve steel for more vital purposes. Each unit comes complete for erection. Sections are held together by metal strip. Albert Kahn Associated Architects and Engineers, Inc., New Center Building, Detroit, has waived patent rights and made available blueprints showing detail

• CORROSION-INHIBITING additive for clear lacquers, nitrocellulose solutions, and alcoholic shellacs, is said to eliminate need for shipping these materials in tin-lined drums and to provide an effective protective film against corrosion of iron or steel containers. Monsanto Chemical Co., Merrimac Div., Everett, Mass.

• WARTIME PROBLEMS of maintaining employee morale, training workers and supervisors, gearing wage and salary policies are discussed in three pamphlets —Personnel Series 55, 56, and 58. The first two are 75c each, the last is 50c. American Management Association, 330 West 42nd St., New York.



QUICK ERRAND-RUNNER for delivery of blueprints, mail, and small parts within large plants is what this electric runabout is. Said to have a top speed of 16 m.p.h. Space behind seat holds load. Blood Sales Co., 40 Atlantic Ave., Long Beach, Calif.

INVESTIGATE THE POSSIBILITIES FOR INCREASED PRODUCTION WITH THESE NEW CURTIS INDUSTRIAL LIGHTING UNITS

FOR VICTORY BUY UNITED STATES DEFENSE BONDS STAMPS

For HIGH INTENSITIES IN HIGH BAYS

Curtis Catalog No. 1570, unit for the 3 KW Mazda AH-9 (Mercury) lamp. Efficient, rugged unit of steel with porcelain enamel reflecting surface. Easily installed from hook hangers. In most cases one unit for a bay is sufficient. Fewer units mean low maintenance and lighting installation cost.

X-RAY SILVER MIRRORED GLASS REFLECTOR units for 750-1000 or 1500 watt P.S. lamps or 400-watt Mercury Vapor Lamp. Simple to install, efficient and comfortable in operation. Unit is available with steel housing (as illustrated), **Cat. No. 1589;** with tripod holder and steel ring at bottom of reflector, **Cat. No. 589T;** or with clamping type holder only, **Cat. No. 589.**

Write for information on these new units or get in touch with the Curtis representative in your area.

For THE GENERAL FACTORY AREA—LONG LINES OF LIGHT

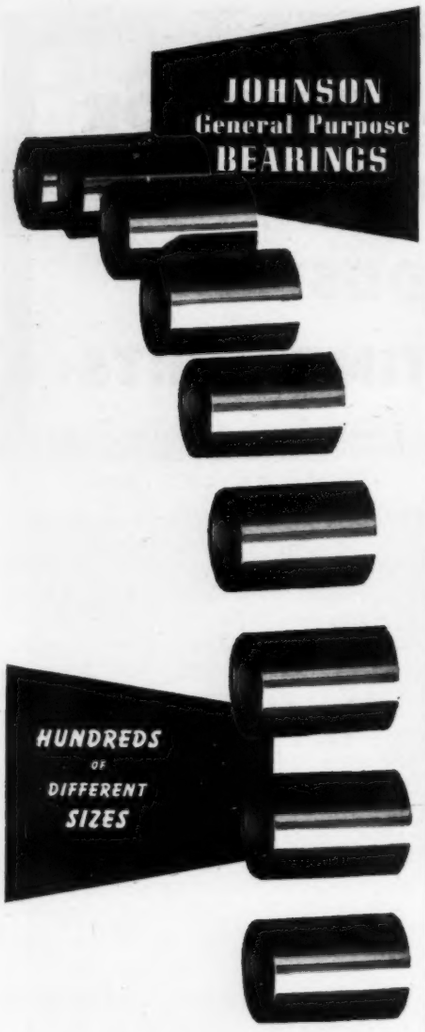
"Tops" for simplicity and economy, these units can be wired for either 2 or 3 40 watt lamps per section. When two lamp units are installed the third lamp can be wired in later to build up intensities as required. Wiring channel sections without reflectors or lampholders are also available, and equipment to convert these sections into additional lighting units can be added later.

Units are of open type with high efficiency Fluracite reflecting surface.

A sliding clamp bracket simplifies suspension from chain or cable. **Catalog No. 1502** for two 40-watt lamps and **Cat. No. 1503** for three 40-watt lamps.

CURTIS LIGHTING, INC.

6135 W. 65th STREET . . . . . CHICAGO



Machine Finished

It's easy to avoid delay in securing plain bronze bearings. Specify JOHNSON *General Purpose* and your order will be shipped from stock. Every bearing is machine finished ready for assembly. Over 800 sizes to choose from . . . twenty two warehouse stocks to serve you. Write for new catalogue.

JOHNSON BRONZE CO.

Sleeve Bearing Headquarters

512 S. MILL ST., NEW CASTLE, PA.

Specify JOHNSON BRONZE

WHAT'S NEW IN EQUIPMENT

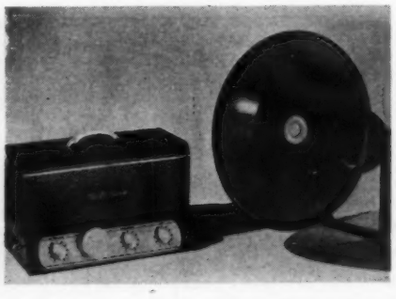
Metal-Inclosed Switchgear

Now available in metal-inclosed cases is 250-volt d.c. air circuit breaker switchgear equipment for heavy duty in steel mills, shipyards, and various industrial applications. Assures safety to personnel and equipment by eliminating the possibility of inadvertent contact with live parts. Gives new safety features to the MC-5 breaker, formerly available only in the "live-front" construction.

Individual air circuit breakers are inclosed in separate steel compartments, as are the control devices of the contactor. Control switches and instruments are mounted semi-flush on the steel panels of the doors to the control device compartments. Arc chutes specially designed to direct gases resulting from circuit interruption lead out from the top of the structure and away from the operating area. Panels can be locked, making the interior accessible only to authorized persons for inspection. General Electric Co., Schenectady.

Air Raid Siren

An electronic type air raid siren, designed to give both great volume for alarms as well as a simple method of crowd control, is announced. Called the Electro-Siren, unit makes use of a vacuum-tube tone generator which can either duplicate the rising and falling tone of a mechanical siren, or can be set at any pitch for best audibility over manufacturing noises. Can also be used to send code messages to air raid officials by dots and dashes. A feature claimed is an arrangement so that a microphone can be used for voice announcements over the same system. Normally operates from any 110-volt source, but in the case of current failure can be switched to 6-volt storage battery operation. Audiograph Division of John Meck Industries 1313 West Randolph St., Chicago.



Cable Paint

Cable paint, known as No. 737 black cable paint, is oilproof and waterproof, flexible, and flame resistant one hour after application to cable. Also resistant to corrosive fumes and heat, it is claimed. For application to all cables, such as power, control, degaussing, motor leads, splices. Supplied at heavy brushing consistency and provides a build-up of 8 mils per coat. Air-dries in 15 minutes. Supplied in 1-, 5-, 30-, and 55-gal containers. John C. Dolph Co., 168 Emmett St., Newark.

Molding

Blacking out a large building with many windows can be made easier by a slotted wood molding with patented slider tape which takes the place of the metal curtain rods. A narrow strip of kiln-dried wood, slotted on one side, can be nailed or screwed to ceiling or window frame. The curtain-hanging device which operates in this molding is a simple cotton tape, set at close intervals with specially designed

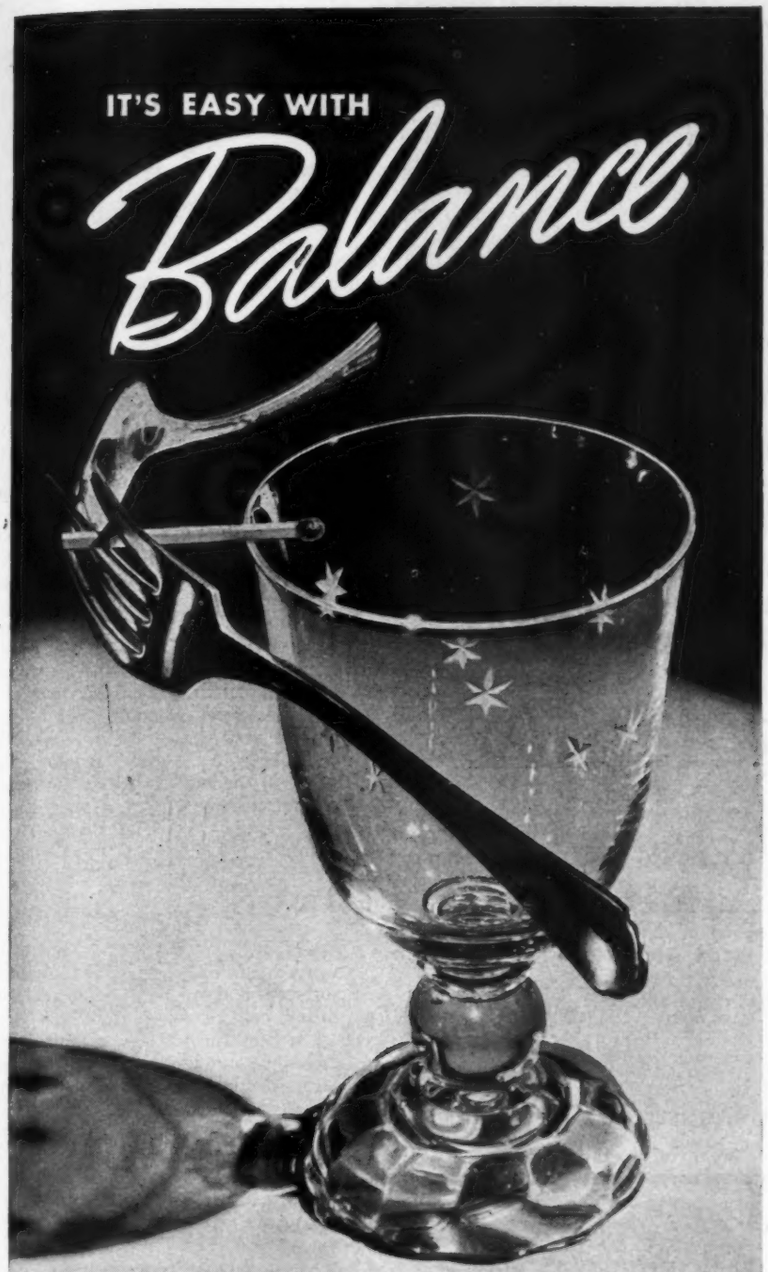
sliders. Tape can be sewed into the top hem of any type of blackout curtain. Sliders are then inserted into the slot. They slip along easily and hold the blackout curtains securely without leakage of light. Molding is available in 4-, 6-, 8-ft. and other standard lengths. The slider tape, which is firmly woven and washable, may be ordered in any desired footage. Jiffy Join, Inc., 203 East 18th St., New York.

Forced-Induction Pumps

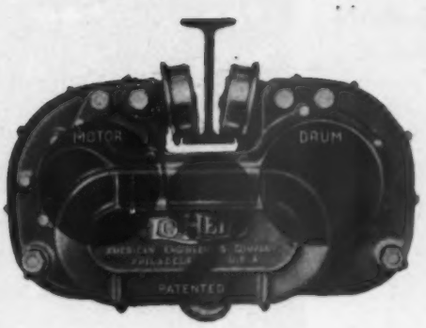
Forced-induction pumps known as Pile Drivers are being manufactured. Designed to dispense heavy, viscous materials such as sealing compounds, sound deadeners, insulating materials, putty, heavy lubricants, and other heavy substances. Two sizes can be furnished—Model 100 for pumping materials from containers up to 10-gal. (100-

IT'S EASY WITH

Balance



AMERICAN ENGINEERING COMPANY

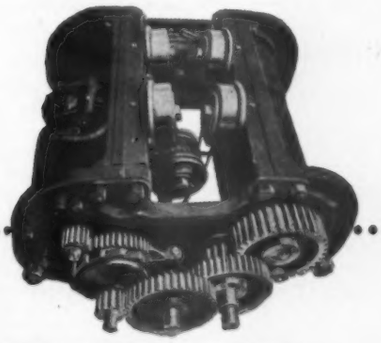


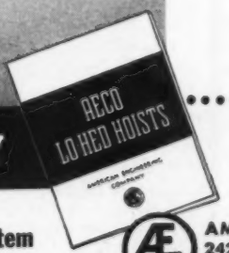
And it's easy to see why BALANCE is important in an electric hoist

The other day our hoist engineer said to us: "In our advertisements we've talked a lot about the balanced design of the Lo-Hed hoist, how it achieves minimum headroom (for which no premium is charged), and allows us to use an efficient all-spur gear drive.

"I think we ought to tell people that balancing the motor and drum about the beam also enables us to design short, strong shafts that minimize torsional stresses and reduce the chances of failure. We might also say that the unique balanced construction of the Lo-Hed hoist permits the use of covers that can be removed with a screw driver to gain access to the motor, brake, cable or drum . . . good points in these times.

"And don't forget that though more Lo-Heds are built today than ever before they are as carefully precision-machined as they were in normal times. A Lo-Hed bought now for war work is an investment in the future." All right, Mr. Engineer, since you've said it all for us, we'll sign off by simply asking the reader of this ad to send in for his copy of the Lo-Hed catalog.





The Lo-Hed Hoist Is Applicable To Any Monorail System
There's A Balanced Lo-Hed Electric Hoist For Every Purpose

•

Look in your Classified Telephone Directory under "A-E-CO LO-HED HOISTS" for your nearest representative

•

OTHER A-E-CO PRODUCTS: TAYLOR STOKERS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER

AMERICAN ENGINEERING COMPANY
2426 Aramingo Avenue, Philadelphia, Penna.

☐ Please send me your complete catalog of LO-HED HOISTS
☐ Ask your representative to get in touch with me promptly

Name_____

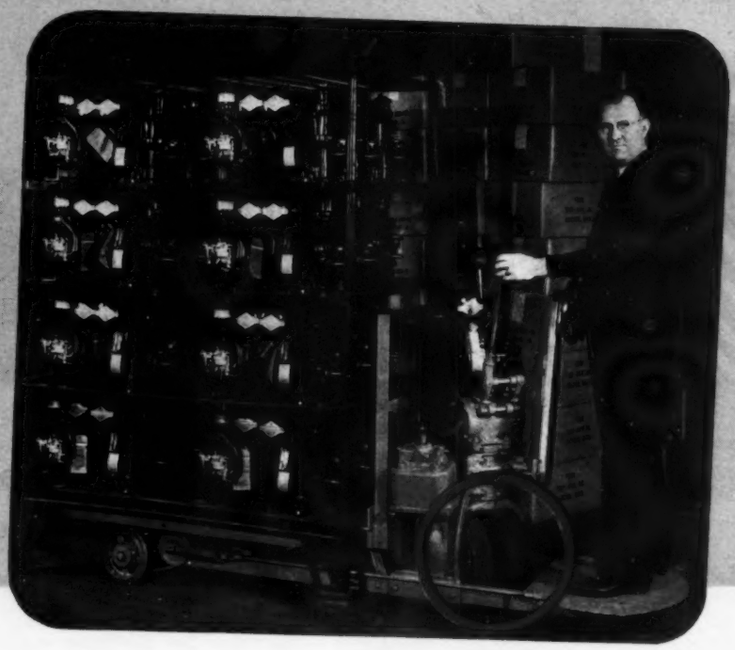
Company_____

Street Address_____

City_____ State_____
(Please Print Plainly)

'HE TRUCK-MAN

uilt by Yard-Man, Inc., ackson, Mich., is shown ere carrying a 2200-lb. oad of motors. The trac- on required for speedy peration and easy ma- euverability, and the ushioning necessary for he gasoline motor are rovided by two 14-inch, -ply General Jumbo Jr. ndustrial Pneumatics.

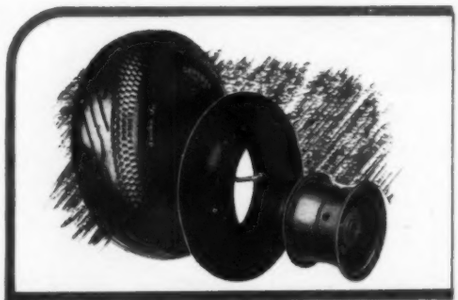


GENERAL TIRES SPEED UP

Factory Transportation, Too

HELPING to speed the transfer of materials and parts—heavy loads . . . delicate equipment . . . all types of products —General Jumbo Jr. industrial pneumatic tires are fighting on America's Factory Front, as well as on many types of equipment employed directly by our armed forces.

The soft, cushioning effect of this pioneer industrial tire-tube-wheel combination protects factory floors, the load, and the truck itself against damage from jarring. Exclusive wide rim provides extra stability. The tire will not pick up chips, filings, etc. from floors. Tire life is far greater. Traction is better —it is practically impossible to spin Jumbo Jrs.



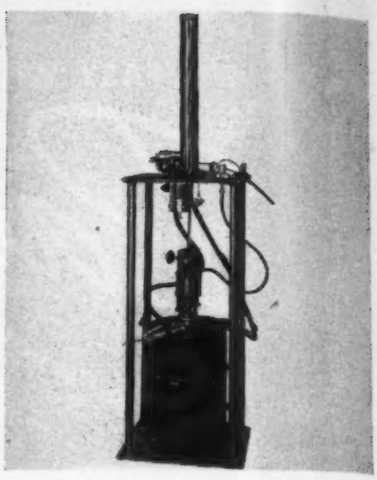
Tires 8" to 24" overall diameter. Load capacity 100 lbs. to 1500 lbs. per tire. 2- 4- 6- and 8-ply with separate tubes and heavy-duty wheels.

For further information, write,

THE GENERAL TIRE & RUBBER COMPANY
AKRON, OHIO

COPYRIGHT, 1942, THE GENERAL TIRE & RUBBER CO., AKRON, OHIO

GENERAL JUMBO JR. INDUSTRIAL BALLOON TIRES



lb.) capacity, and the Model 400 for pumping material from 55-gal. (400-lb.) drums. Each can be arranged as a single- or a two-stage unit. The single-stage unit is for use where pulsation in the flow of material is permissible. The two-stage unit has a pulsation eliminator that delivers the extruded material at an even rate of flow and in uniform size and shape as desired. The delivery of materials in both models is controlled by a hand-operated shut-off valve at the outlet, and is always under control of the operator. Lincoln Engineering Co., 5701 Natural Bridge Ave., St. Louis.

Floor Repairing Material

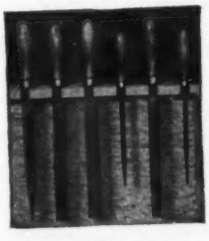
Speed Patch, for repairing holes, spalls, worn expansion joints, or as a complete resurfacer of floors, is announced. Ready-mixed, cold plastic material to be used as taken from the package. Claimed to be a one-minute or less operation; may be laid during working hours without interrupting plant operations, and is benefited rather than injured by truck traffic while installing. For complete resurfacing, Speed Patch may be dumped on the floor and rolled out to a smooth, ready-to-use floor, according to the manufacturer. Will handle any weight load, and provides a safe, low-traction, permanent floor repair. Oil and grease resistant. Rock-Tred Corp., Dept. B, 605 W. Washington Blvd., Chicago.

Incandescent Luminaire

Especially adapted for extreme service locations, such as steel mills, foundries, chemical plants, or wherever acid fumes, dust, smoke, or excessive moisture is present, vapor-tight Millite luminaire for incandes-

POP'S HOT FOR THE "Make 'em last longer" IDEA

TH' GUY WHO LEFT THAT NICHOLSON FILE OUT HERE TO RUST BETTER DUCK DOWN IN HIS BOMB SHELTER!— POP'S JUST HIT BOILING POINT!
YEH!— DON'T NOBODY LIGHT A MATCH!— TH' OL' MAN'S HIGH EXPLOSIVE ON THE SUBJECT OF NEGLECTED TOOLS!
WITHOUT LOOKIN' AT NO CRYSTAL BALL, I KIN TELL WHAT A CERTAIN WAR WORKER IS IN FOR! I KIN EVEN SMELL TH' SULPHUR AN' BRIMSTONE!



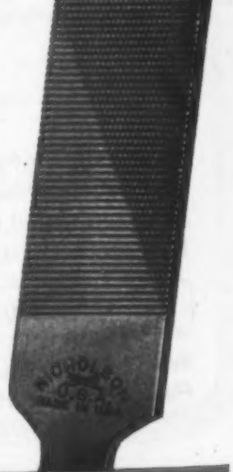
NEGLECT or abuse of files wastes fine tool steel . . . slows up war production. To get the most out of files, the efficient shop management will impress upon workers these rules of proper use and care:

- Use *The right file for the job.*
- Never "tear" into the work with too much pressure on the forward, or filing, stroke.
- Never "drag" the file back under needless pressure.
- Don't throw files into a drawer or tool box containing other tools or objects.
- Files should never be laid on top of or stacked against each other. Keep them separate—either standing with tangs in holes or hung on a rack by their handles.
- Keep files in a dry place so rust will not corrode their cutting edges.
- Keep files clean of filings or "chips." After every few strokes tap the file on the bench to loosen the chips. File teeth should also be brushed frequently with a file brush or card—and always before putting the file away.

The better the file the greater the reward of care. Nicholson and Black Diamond brands are of the highest quality—made to serve long under normal circumstances, still longer under proper care. *Twelve perfect files in every dozen* is the Nicholson guarantee. Consult your mill-supply house.

BRASS FILE (illustrated)—One of many Nicholson Special Purpose Files. Short upcut angle with *very fine* and long-angle overcut. Made to prevent "grooving" in soft metal, break up filings, and enable file to clear itself of chips. *FREE TECHNICAL BULLETIN.*

NICHOLSON FILE CO., Providence, R. I., U. S. A.
(Also Canadian Plant, Port Hope, Ont.)

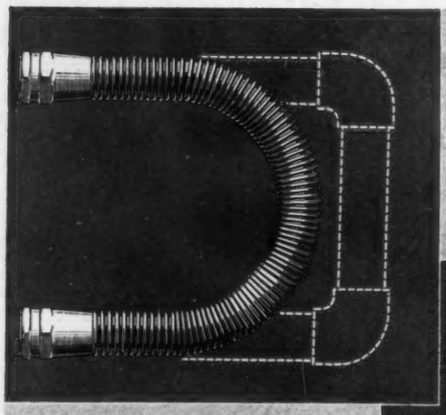


NICHOLSON FILES
FOR EVERY PURPOSE

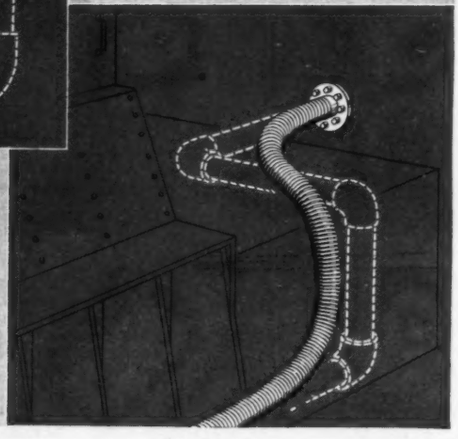
add speed

to assembly, maintenance, repair and temporary hook-ups

Use flexible metal hose . . . for pipe connections where speed of installation is paramount



Rex Flexible Metal Hose can be bent to position by hand and coupled, in a fraction of the time required to fit a pipe connection. ←



Rex Flexible Metal Hose can be "snaked" quickly into place in installations requiring turns, eliminating all intermediate connections. →

Rex Flexible Metal Hose speeds up production, facilitates assembly, reduces down-time. Ask for recommendations on the type of metal hose best suited to your needs from the wide and diverse Chicago Metal Hose production types available.

Use our production capacity to increase your production

Rex-Weld Corrugated Flexible Metal Hose • Rex-Tube Interlocked Flexible Metal Hose • Rex-Flex Stainless Steel Flexible Tubing Avioflex Oil Line Hose • Cellu-lined Hydraulic Hose

CHICAGO METAL HOSE CORPORATION

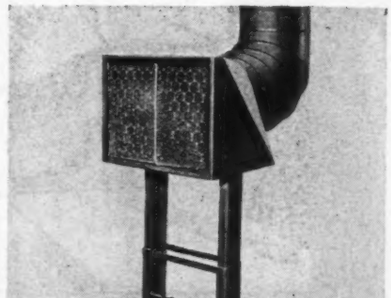
MAYWOOD, ILLINOIS

Factories: Maywood and Elgin, Illinois

cent or mercury lamps is announced. Because of its weatherproof construction, the unit can be used satisfactorily for outdoor applications. Consisting of three parts, porcelain enamel steel reflector available in several sizes, socket assembly, and hinged glass cover, unit is arranged for conduit mounting. Reflectors for 300- and 500-watt sizes are made from 19 gage iron sheet, and the 400-, 750-, and 1000-watt sizes are from 18 gage. Vapor-tight sealing is obtained with a heavy, treated asbestos gasket between cover and housing. An impact-resisting glass lens ¼ inch thick is designed to withstand sharp temperature changes and, if broken, shatters into small dull fragments rather than splitting into large pieces. Westinghouse Lighting Division, Edgewater Park, Cleveland.

Dust Collector

Portable dust collector, called Filtaire, is suited for use with grinding and polishing machines where no central dust collecting system is available. Motor and fan are located behind replaceable Dustop filter so that all bearings are protected from dust and grit. The 2x16x20-in. filter is made from fireproof spun glass. Purified air is expelled through a right angle elbow at the back of the collector.



Easily portable from one machine to another. Top of the unit is adjustable 7 inches horizontally, and 20 inches vertically, so that it may be positioned correctly for any machine, wheel, or type of work. Complete, self-contained unit; necessary only to plug in the electrical connection to a 110-volt outlet. Edward Blake Co., 634 Commonwealth Ave., Newton Centre, Mass.

Blackout Material

A formula designed for blacking out windows, skylights, and other glazed openings in industrial buildings has recently been announced. Outstanding features claimed are complete opacity, non-reflective surface, high degree of shatter resistance, and ease of application. Formula consists first of an application of a $\frac{1}{16}$-in. layer of Ruberoid plastic cement over the outside area of each pane. Over this a sheet of Ruberoid saturated asbestos felt, cut slightly larger than the pane, is applied, and the felt is then covered with another layer of plastic cement applied with a

Have you tried Scully?

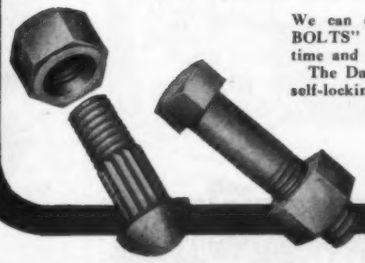
WE are not magicians, but we will do everything within our power to help you get the materials you need. We have stocks of many steels on hand, also tools, machinery and other equipment.

Be sure to try Scully — see our phone numbers below. Cut out the number of the warehouse nearest you and paste it in a handy spot.

Structural material
Plates, various qualities
Floor Plates
Sheets: Hot Rolled, Cold Rolled, Galvanized, etc.
Bars (all shapes): Hot Rolled Carbon and Alloy grades
Hot Rolled Strip Steel
Spring Steel · Tool Steel
Drill Rod
Cold Finished Bars, Carbon and Alloy grades
Wire
COR-TEN and MAN-TEN Shapes, Sheets and Plates
Abrasion-Resisting Sheets and Plates
Eaves Trough, Conductor Pipe
U·S·S Stainless Steel and Stainless products
Expanded Metal
Rails
Boiler Tubes
Rivets, Bolts, Nuts, Washers
Dardelet Rivet and Machine Bolts
Nails
Welders and Welding Accessories
Chain
Clamps
Flanges
Expanders, etc.
Hoists, Shears, Rolls, Punches, Cut-Off Machines, Saws, Nibblers, etc.

CHICAGO	**BRUnswick 2000**
Teletype CG. 605	
BALTIMORE	**GIlmore 3100**
Teletype BA. 63	
BOSTON	**STAdium 9400**
CLEVELAND	**HEnderson 5750**
Teletype CV. 153	
PITTSBURGH	**CEdar 7780**
Teletype PG. 475	
ST. LOUIS	**MAin 5235**
MINNEAPOLIS - ST. PAUL	**NEstor 2821**
NEWARK, N. J.	**BIgelow 3-5920**
	BErgen 3-1614 - REctor 2-6560

IN STOCK! DARDELET "RIVET-BOLTS"



We can offer immediate shipment of both Dardelet "RIVET-BOLTS" and Dardelet Machine Bolts. These bolts save valuable time and labor and assure permanently tight joints.

The Dardelet "RIVET-BOLT" is a ribbed bolt with Dardelet self-locking thread, and is widely used for field erection of structural steel. Has recessed nut. Bolt is driven in and nut is applied with wrench. Economical and strong.

The Machine Bolt with Dardelet self-locking thread is for general use where vibration is present.

Scully Service

USS

SCULLY STEEL PRODUCTS COMPANY

Distributors of Steel and Steel Products

Warehouses at CHICAGO · NEWARK, N. J. · ST. LOUIS · BOSTON
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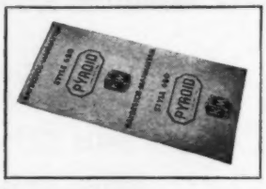
UNITED STATES STEEL

Production can be *Safely Speeded Up* with R/M PACKINGS



Because they have always been made a little better than necessary for ordinary production, R/M packings can now be depended upon to provide an extra measure of protection in war industries where production has been speeded up.

Naturally, there is a limit beyond which no machines or materials can be pushed. But R/M engineers are aware of the strains and stresses to come and are working to make R/M packings to meet the emergency. You can depend upon them in the future, as you have in the past.

Meanwhile, it will be helpful to you to have a copy of the R/M keyed, illustrated and indexed catalog in which you can quickly find the right packing for practically any ordinary industrial application. Get a copy from your R/M distributor or write us direct.

INDUSTRIAL SALES DIVISION
RAYBESTOS-MANHATTAN, INC.
MANHEIM, PA.
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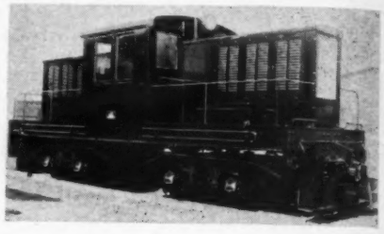
Makers of Packings for Every Industrial Use

trowel. Within three or four days surface becomes a dull black that is said to be non-reflective. Properly applied, the manufacturers state, the formula not only effects a complete blackout, but adds greatly to the shatter-resistance of the glass. The materials can be applied quickly and easily, without any preliminary cleaning of the glass and without interior scaffolds. The Ruberoid Co., 500 Fifth Ave., New York.

Switching Locomotive

Outstanding feature claimed for 65-ton diesel electric switching locomotive is the construction of the drives which give it its pulling power. Drives are of double reduc-



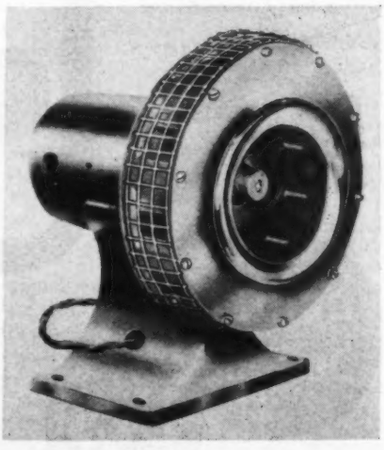
tion spur gear type, totally inclosed, and arranged so that motors are mounted as integral parts of the drives. Atlas Car & Mfg. Co., Cleveland.

Protective Cream

Man-O, a bland skin-protective cream serves as a guard against skin irritants it is claimed. Forms a film-like, invisible, and flexible glove, protecting the skin from absorbing grease, cutting oils, paint, gasoline, and other matters difficult to clean off. Can also be used effectively as a guard against occupational skin irritations. Washes off easily with soap and water. Packaged in 12-oz. cans or in bulk. Sabern Products Co., 5511 Euclid Ave., Cleveland.

Air Raid Siren

To provide air raid protection to employees in industrial and power plants, warehouses, mills, and factories, Tornado air raid sirens were designed. Two models, one for small departments, offices, laboratories, stockrooms, and a larger one for manufacturing areas, which will definitely be heard above



the usual din of machines at work. Equipped with Universal motors for either alternating or direct current. Operate from any ordinary light current. Equipped with base for either vertical or horizontal mounting. Breuer Electric Mfg. Co., 5100 Ravenswood Ave., Chicago.

Safety Clothing

Neoprene coated clothing, including coats, pants, coveralls, welding jackets, aprons, sleeves, leggings, and gloves, provides pro-

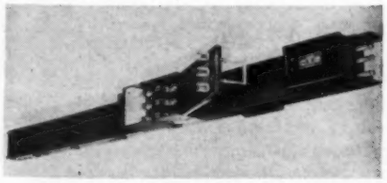
tection against heat, sparks, splash, acids, chemicals, and oils, according to the manufacturer. Most items are available in light- or heavy-weight material. Safety Clothing and Equipment Co., 7016 Euclid Ave., Cleveland.

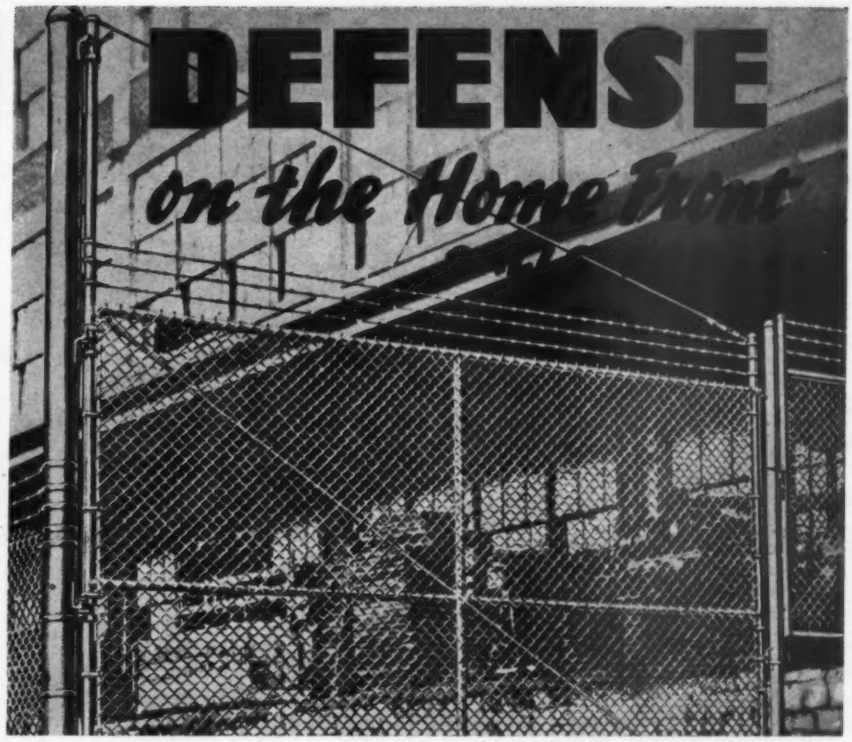
Magnesium Fire Extinguisher

Magout Powder has been developed to extinguish magnesium fires. Instantly smothers fires causesd by magnesium shavings in machine shops, or by magnesium incendiary bombs, it is claimed. Is a non-absorbent, fine dry powder, safe to handle and easy to use. Available either in bulk quantities or in instant-action tubes for sprinkling on fire. Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn.

Plug-In Duct

Saflex plug-in duct, recently released, is an up-to-date method of supplying current or electrical energy to the many outlets demanded in modern industry. Available in capacities of 250, 375, 500, 750, and 1000





JIM BROWN

CHAIN LINK FENCING

The permanent, effective protection offered by JIM BROWN Chain Link Fencing is the first step in defense of the home front . . . the primary act in "stopping the saboteur." With so much at stake . . . with vital war materials in greater volume so desperately needed . . . you *must* guard against intrusion, and theft, and premeditated damage. Government contracts require adequate plant protection.

JIM BROWN Chain Link Fencing is ideal to meet these needs. It comes in heights up to 96 inches. Fabric is heavily galvanized, Posts are redrawn seamless steel tubing. Barb Wire Extension Arms and Top Rails are optional. Gates are standard styles or custom built.

Whatever your fencing needs may be JIM BROWN can fill them! Fill in the coupon below—attach a sketch giving important facts, such as location of Line, Corner, End and Gate Posts, distances between posts, height wanted, number and size of gates, etc.,—and we'll be pleased to submit an estimate. Your own men, or local help, can easily erect the fence with our instructions. Remember—with JIM BROWN Chain Link Fencing, you get the protection of a solid brick wall, at a fraction of the cost. This is important today!!

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Send for Complete Information and FREE ESTIMATE

Mail Coupon Today!

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Gentlemen:

Attached is a sketch of the area I wish to enclose, with specifications. Please send me complete information and *Free Estimate*.

Name .....

Firm .....

City ..... State .....

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Move More Material
FASTER
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Planned and installed to meet handling needs in your plant, Standard power driven or gravity operated conveyors assure smooth, uninterrupted service 24 hours daily, a full seven days per week—keep materials and parts flowing—fast and sure—from machine to machine —department to department—help maintain the swift tempo of wartime production.
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Fully illustrated—the booklet, "Conveyors by Standard," is a "mine of information" on conveying methods with power and gravity conveyors—contains 76 pages of data—representative installations in all types of industries—a useful reference book for production executives. Write for your copy of Bulletin FM-6—"Conveyors by Standard."
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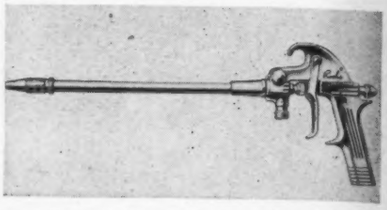
Standard CONVEYORS
FIRST FOR FASTER PRODUCTION

amps., in 2- and 3-wire single-phase, 3-phase, and 4-wire service.

Uses round, tubular buses for 250, 375, and 750 capacities, and solid, round busbars for 500 and 1000 amps. Round busbars are contained in a steel housing which is produced in standard 10-ft. lengths. Six openings provided on each side to accommodate 12 plug-in units. Square D Co., Switch & Panel Division, Detroit.

Cleaning Gun

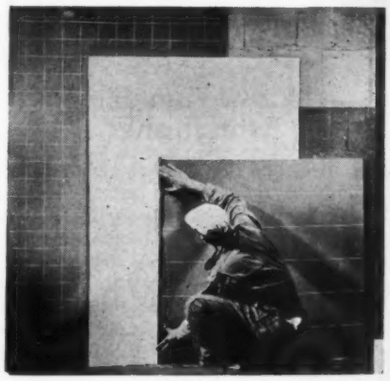
Cleaning gun known as No. R3-EC can be used for any kerosene-type cleaning fluid. Equipped with pistol grip, adjustable material control, adjustable nozzle, and ¼-in. standard pipe-thread air connection. Uses



about 4 cubic feet of air per minute at 40- to 50-lb. pressure. Can be used with quart syphon cup or suction hose running into open container. Binks Mfg. Co., 3114–40 Carroll Ave., Chicago.

Coated Panels

Plastic-coated wall panels that are prefinished and require no "on-the-job" treatment after installation are supplied in sheets as large as 4x8 feet. Designed for either new structures or for modernizing by covering old walls and ceilings, sheets are best applied by a waterproof adhesive, but may also be installed with brads. Available



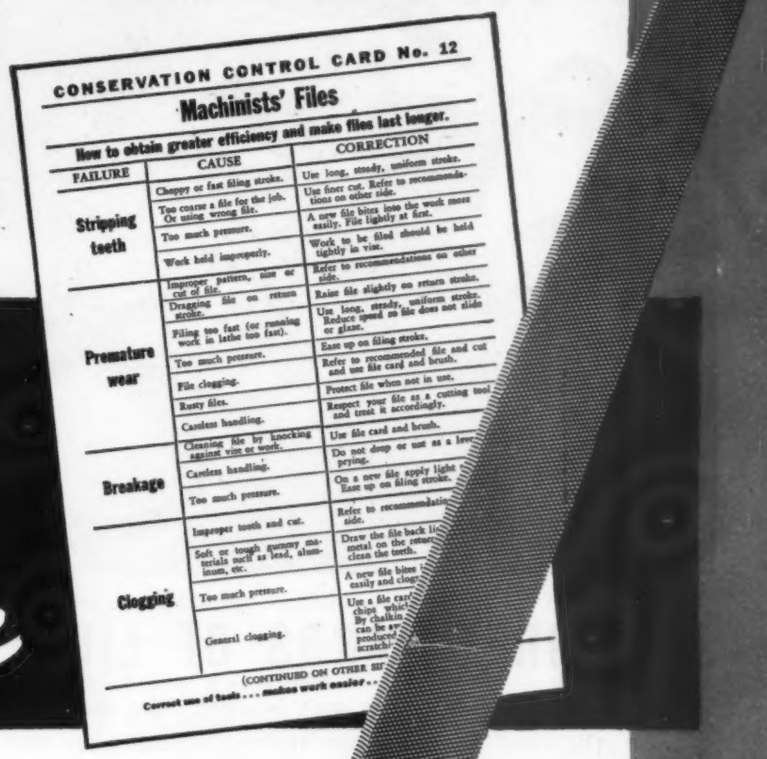
in 10 colors which are permanently bonded to the sheets by heat-treatment. The surface is waterproof, stainproof, dirtproof, verminproof, and may be cleaned with soap and water. Available in three types—tileboard, panelboard, and streamlined board. May be installed by any competent carpenter. Barclay Manufacturing Co., 385 Gerard Ave., New York.

Water Coolers

Complete line of water coolers is announced. Features claimed include conservation of floor space, great volume of water, condensing units that conserve electric power. Models include air-cooled pres-

The DISSTON CONSERVATION CONTROL PLAN will help you

Save more and Serve better



CONSERVATION CONTROL CARD No. 12

Machinists' Files

How to obtain greater efficiency and make files last longer.

FAILURE	CAUSE	CORRECTION
Stripping teeth	Choppy or fast filing stroke.	Use long, steady, uniform stroke.
	Too coarse a file for the job. Or using wrong file.	Use finer cut. Refer to recommendations on other side.
	Too much pressure.	A new file bites into the work more easily. File lightly at first.
	Work held improperly.	Work to be filed should be held tightly in vise.
Premature wear	Improper pattern, size or cut of file.	Refer to recommendations on other side.
	Dragging file on return stroke.	Raise file slightly on return stroke.
	Filing too fast (or running work in lathe too fast).	Use long, steady, uniform stroke. Reduce speed so file does not slide or glaze.
	Too much pressure.	Ease up on filing stroke.
	File clogging.	Refer to recommended file and cut and use file card and brush.
	Rusty files.	Protect file when not in use.
	Careless handling.	Respect your file as a cutting tool and treat it accordingly.
Breakage	Cleaning file by knocking against vise or work.	Use file card and brush.
	Careless handling.	Do not drop or use as a lever for prying.
	Too much pressure.	On a new file apply light pressure. Ease up on filing stroke.
Clogging	Improper tooth and cut.	Refer to recommendations on other side.
	Soft or tough gummy materials such as lead, aluminum, etc.	Draw the file back lightly, depositing metal on the return stroke. Then clean the teeth.
	Too much pressure.	A new file bites into the work more easily and clogs less.
	General clogging.	Use a file card frequently. Metal chips which clog the file teeth. By chalking the file teeth, filings can be avoided. Chalk produces a smoother, finer scratch-free finish.

(CONTINUED ON OTHER SIDE)

Correct use of tools . . . makes work easier . . .

Disston Bite-Rite Files

In all double cut Bite-Rite File patterns the teeth are staggered. This produces a file which successfully combines speed of cut, long life and smoothness of filed surface.

In production for war, the more you save the more you can supply. The conservation of tools, time and materials was never so vital!

The Disston Conservation Control Plan is a nationwide program to help manufacturers reach and maintain maximum production . . . by making better use of equipment . . . by extending the useful life of tools . . . by saving time and essential materials.

Disston Conservation Control Instruction Cards are an important feature of this Plan. There are 34 in all, each applying to a different type of cutting tool. The cards contain expert information and practical instructions to help you prevent delays and waste . . . to simplify supervision . . . and to speed production by the proper selection, operation and maintenance of tools. You can use these cards to make tools last longer, to improve workmanship and product and to forestall failures and shutdowns.

Hundreds of important manufacturers are now applying these cards in a wide variety of operations. Disston Conservation Control Cards are available to *you* without cost or obligation, whether or not you use Disston products. Send now for the type and quantity you require.

Get this Free Booklet

Here is complete information on the Disston Conservation Control Plan, reproductions of the Instruction Cards, and an order blank for your convenience. Write for this booklet today!

Waste has no place in industry today! A free booklet tells you all about the Disston Conservation Control Plan to save time, tools and materials. Write for it today to Henry Disston & Sons, Inc., 624 Tacony, Philadelphia, Pa., U. S. A.

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CONSERVATION • SERVES EVERYONE • HENRY DISSTON & SONS, INC.

THREE YARDS OF LIGHT

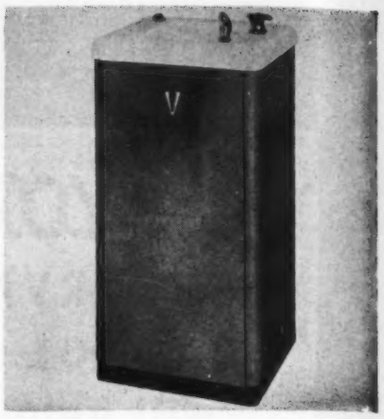
Industrial lighting isn't bought, like cloth, by the yard. For a proper lighting installation, two things are important—the equipment itself and the skill and technical know-how necessary to lay it out. The design, manufacture and layout of efficient, economical, long-lived lighting equipment have been Silv-A-King's special job for 21 years. Whether your light source is fluorescent or incandescent, Silv-A-King equipment and engineering experience will make it *work* for you. Bright Light Reflector Co., Inc., 1027 Metropolitan Avenue, Brooklyn, N. Y.

Write for one or both of these Silv-A-King Lighting Guides: LG1 — Fluorescent, or LG2 — Incandescent.

A Few Typical Silv-A-King Users:
AC SPARK PLUG
GENERAL MOTORS
FISHER BODY
INTERNATIONAL HARVESTER
JONES & LAUGHLIN STEEL
PITTSBURGH PLATE CLASS
and many others

FLUORESCENT • INCANDESCENT
SILV-A-KING
EQUIPMENT

SILV-A-KING MAKES *Light* WORK FOR YOU



sure bubblers, air- or water-cooled heavy-duty bubblers, bottle water coolers, water fountains. Oasis Cooler Div., The Ebco Mfg. Co., Columbus, Ohio.

Fire Extinguishing Compound

Dry fire-extinguishing compound, duMag, is a powder developed specifically for extinguishing magnesium and incendiary bomb fires. The manufacturers claim its advantages over salt or sand to be: Takes less to extinguish the fire, it is moisture-resistant, remains free-flowing even when stored for long periods, is non-abrasive, and will not react with burning magnesium. It can be applied directly from the container to the fire, or to the burning bomb, with scoop, shovel, extinguisher, or other mechanical means. Available in 45-lb. pails and in 12-lb. tubular containers. DuGas Engineering Corp., Marinette, Wis. (Owned and operated by Ansul Chemical Co.)

Wooden Filing Units

An answer for engineering departments faced with the wartime problem of fitting wooden units into a blueprint filing set-up that has been built up on steel unit con-

struction and interchangeability. Victory filing units are especially designed to fit in with present steel equipment. Styled and finished in olive green. Interlock and stack with standard steel units. Hamilton Mfg. Co., Two Rivers, Wis.

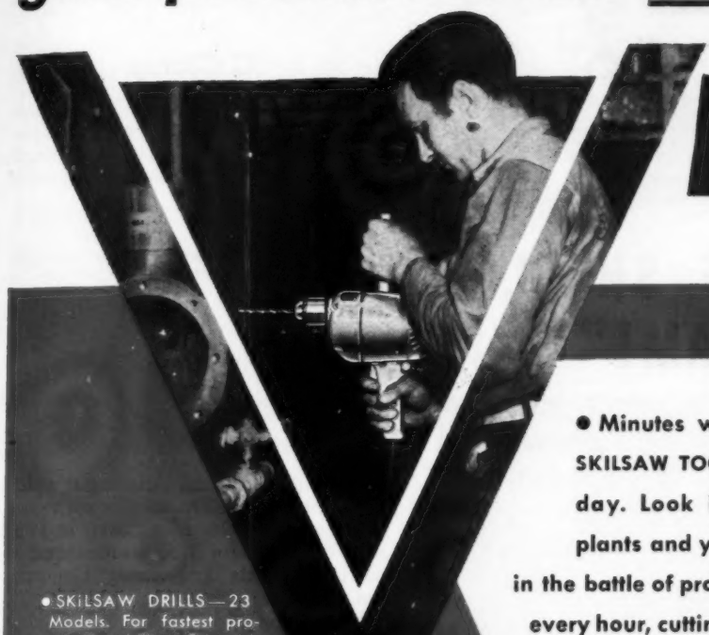
Anti-Corrosive Wrappings

Alloys and all metals with high finishes are subject to corrosion. It is caused by oxygen in the air or moisture or both. Machined metal surfaces are protected by corrosion-inhibiting oily or waxy materials, but the coated part must be wrapped in a paper that will not absorb these corrosion inhibitors or allow them to pass through to the outer container. Anti-corrosive, oilproof

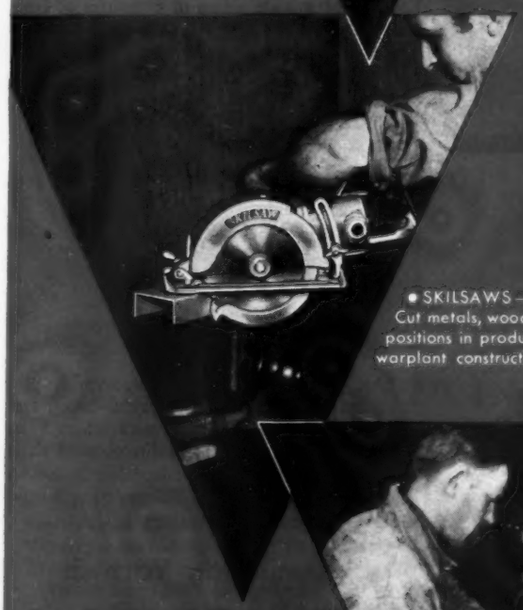
★ SKILSAW TOOLS ★

give production the SPEED that leads to

VICTORY!



• SKILSAW DRILLS—23 Models. For fastest production drilling. Capacities from ¼ in. to ⅞ in. in steel.



• SKILSAWS—9 Models. Cut metals, wood and compositions in production and warplant construction.

• SKILSAW DISC SANDERS—6 Models. Grind, file, sand and polish on all flat or curved surfaces.

• SKILSAW BELT SANDERS—4 Models. For all finishing and sanding on wood, metals and compositions

• Minutes were never before so precious . . . and SKILSAW TOOLS never as important as they are today. Look into Americas's busiest war-work plants and you'll find SKILSAW TOOLS at the front in the battle of production—packing more work into every hour, cutting days from schedules, speeding the flow of vital goods that are needed for Victory! • Are there jobs in your plant that should be done sooner? Your distributor will gladly demonstrate how SKILSAW TOOLS can help.

SKILSAW, INC.
5043 Elston Ave., Chicago

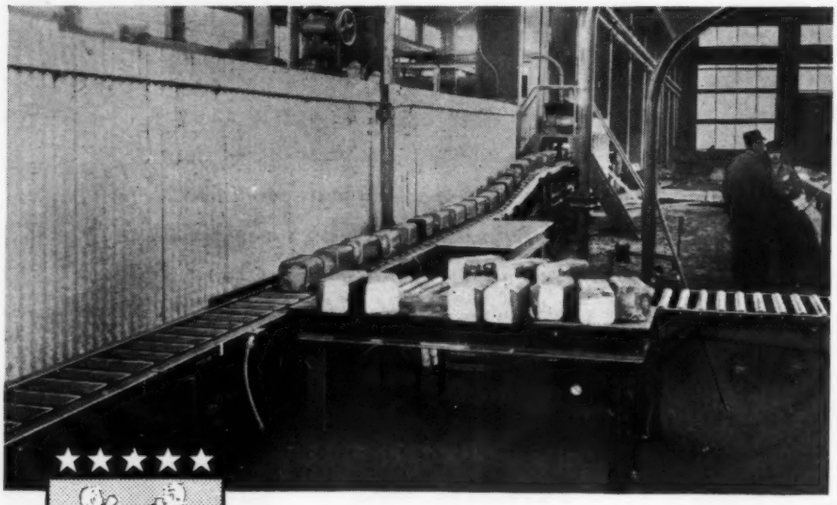
New York • Boston • Buffalo
Philadelphia • Cleveland
Detroit • Indianapolis
St. Louis • Kansas City
Atlanta • New Orleans
Dallas • Los Angeles
Oakland • Seattle
Toronto, Canada

★

SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

AN APRON FULL OF SHELLS FOR UNCLE SAM!



THIS Alvey-Ferguson *Apron* Conveyor installation carries billets from shearing machine to the furnace, where they are turned into rough forgings ready to be machined into the shells which Uncle Sam needs to win this war.

Ruggedly built to withstand terrific wear, the aprons are made of channel carried on roller chains, with a cover angle over the top of the chains so that the top of the channel and the angle iron frame are flush. This makes it easy to slide the billets over the cover angle onto the channel aprons of the apron conveyor.

At various stages of production the conveyor carries the billets at elevations most convenient to the operators of the furnace, and various forging machines.

Whatever *your* material handling or product movement problem we can solve it with an A-F conveyor installation. Write, wire or phone, without obligation on your part for a consultation.

The Alvey-Ferguson Co., 126 Disney St., Cincinnati, O.

CONVEYING A-F MACHINERY

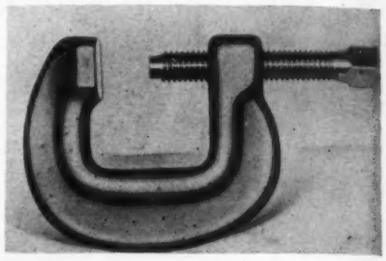
ALVEY-FERGUSON *Conveyors*

AND PRODUCT WASHING MACHINES

papers provide high strength, pliability, and moisture-vaporproofness. Available in various forms, rolls, sheets, or bags, or can be made to order. Some of these papers are combinations of greaseproof, anti-acid glassine, laminated with a special agent to a Fourdrinier anti-corrosive Kraft stock. Riegel Paper Corp., 342 Madison Ave., New York.

C Clamp

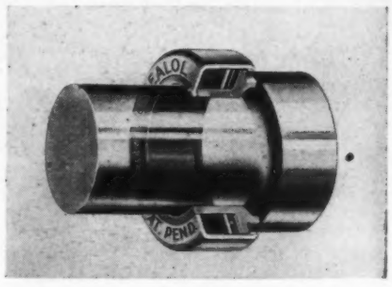
Having a breaking point of 7800 pounds, high-strength C clamp is now being manufactured. This extreme clamping strength is achieved by a 100 percent drop-forged



manufacturing process, including complete heat-treatment of all parts. Screw is square-head type. Available immediately in 1¼-in. size. Other sizes will be manufactured to order. Products Engineering Company, Los Angeles.

Fluid Seal

Known as Sealol, compact balanced-pressure, rotary-type fluid seal is claimed to seal fluids at a wide range of pressures at high speeds; minimize frictional heat and power loss; exclude foreign matter from bearings.



One complete unit, easy to assemble into equipment, requires no special tools, and is applicable to plain or antifriction bearings. Operates in either direction of shaft rotation, and is readily adaptable to special conditions. Stevenson Engineering Corp., 45 Willard Ave., Providence, R. I.

Insulating Varnish

Developed to meet coil insulation requirements of generators, insulating varnish, known as Thermoset, capable of withstanding high temperatures is announced. Varnish is a synthetic resin type cured by heat-induced chemical polymerization. It sets to an infusable, flexible, inert film of clear amber color, and is high in dielectric and bonding strengths.

Of low viscosity, varnish will not skin over or gum up equipment with an insoluble film, and will penetrate the deepest windings to fill interior voids completely.

"Production Drive?" It's 2 to 1 on Research Leather Belting over Rubber V-Belts

This has been proved: "The life of a first quality leather belt on a pivoted motor drive is ordinarily *two or more* times as great as the life of a rubber V-belt on a corresponding drive." From *Fifty Reports on Mechanical Power Transmission from Motor Drive to Industry* by Robert Drake.

And this has been proved too: Research Belting out-delivers other leather belting by at least 3%. It is manufactured under *single* control, from green hide to finished belt. Built-in pulley-grip... stretch removed during tanning and finishing... greater resistance to flexing wear.

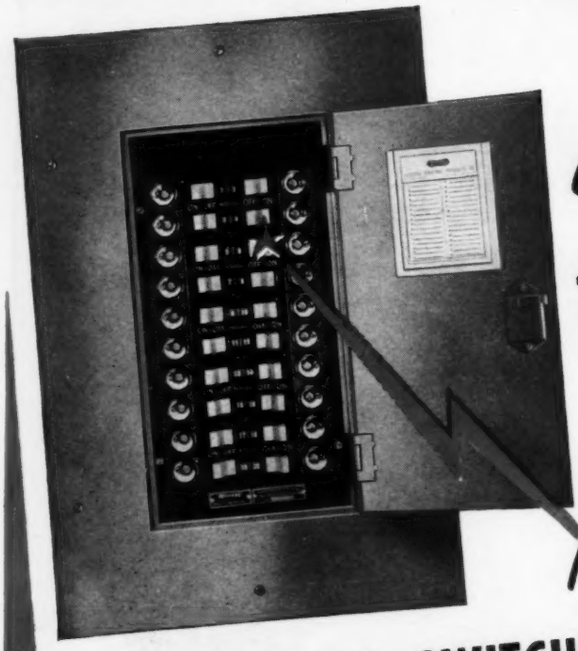
On "Production Drive," Research is the production belt

Research Leather Belting on Pivoted Motor Base Drive (Production Drive)

GRATON & KNIGHT CO. Worcester, Massachusetts

Only leather belting manufacturer with complete nationwide service facilities. Distributors listed on Graton & Knight page in THOMAS' REGISTER

FEDERAL
ELECTRIC PRODUCTS



at this point

THE "SAFETY SWITCHMAN" CARRIES THE LOAD

In Federal Panelboards, the "Safety Switchman" is an ingenious switch that stands constant watch ahead of every fuse. This means a higher safety factor and perfect control protection of lighting and small power circuits. Federal Type NTPR Panelboards—to handle from 4 to 40 circuits—are compact, ruggedly built, and approved by Underwriters Laboratories. They have quality construction features that you'd expect would cost considerably more. *For complete Federal panelboard specifications, write for Bulletin No. 21-40.*

FEDERAL PANELBOARD FEATURES

Shallow Boxes for Thin Wall Mounting • Large Wiring Gutters
Flush Locks and Catches, Concealed Hinges • Plenty of Knockouts
Solderless Terminal Connectors • Rugged Construction
Giant Switches • Low Cost

FEDERAL ELECTRIC PRODUCTS COMPANY, INC.
58 PARIS STREET, NEWARK, N. J.

Follow the Federal Line

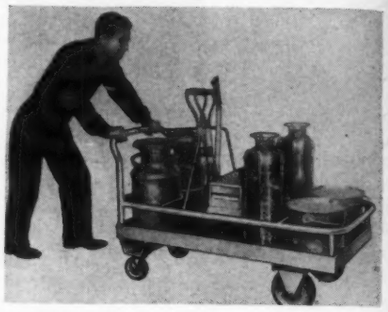
PANELBOARDS • SWITCHBOARDS • SAFETY SWITCHES • CIRCUIT BREAKERS

Waterproof and oilproof, is not affected by acids or alkalis in ordinary concentrations. When cured, the material protects enamel coating on magnet wire, will not corrode uncoated metals, and guards against rust.

In applying Thermoset to a winding, the unit is soaked until bubbling ceases. Winding is then drained and baked at 275 to 300 degrees Fahrenheit until thoroughly cured. Baking time depends on the size of the unit and usually ranges from 6 to 24 hours. Westinghouse Elec. & Mfg. Co., E. Pittsburgh.

Air Raid Truck

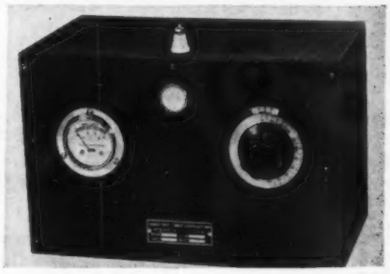
Truck, measuring 48 inches in length and 24 inches wide, has spaces partitioned off for holding sandpails, watercans, fire extinguishers, axe, shovel, rake, and other necessary equipment. Also has strong metal



box with hinged lid for asbestos gloves, smoked goggles, first aid kit, and similar small supplies. Truck is all-metal, welded construction throughout and painted a bright fire department red. Palmer-Shile Co., Detroit.

Automatic Air Raid Signal

Set is designed to control lighting circuits or give an audible alarm during an actual air raid warning. Device is tuned to the carrier signal of key radio stations which are on the air 24 hours a day. In the event of a signal from the Interceptor Command



for the station to cease broadcasting, the Robot Raid Warden is automatically set in action. Incorporated in the Robot is a pilot light which is located on front panel of the unit. This light goes on as soon as the unit is plugged in to the power sources and indicates unit is operating efficiently. Standard unit is 115 volts, 50 or 60 cycles, a.c. Industrial Timer Corp., 115 Edison Place, Newark.

Thermometer

Known as submarine thermometer, 5-in. industrial thermometer lends itself to diesel engines, air compressors, lubricating lines

Helping THOSE WHO HELP

M-H UNIT HEATER CONTROLS KEEP DEFENSE WORKERS AT TOP EFFICIENCY

Minneapolis-Honeywell is not only doing its share in the all-out war program, but is helping others who help as well. Minneapolis-Honeywell automatic processing controls and automatic heating and air conditioning controls provide faster production, conserve raw materials and promote employee efficiency. When you convert your present plant to war production, or build a new one, remember the essential importance of M-H Controls. Remember that M-H Controls eliminate production waste by maintaining product uniformity and conserve fuel by maintaining exactly the temperature needed. Minneapolis-Honeywell manufactures a full line of both electric and pneumatic controls and is in a position to assume undivided responsibility for the complete control system. Minneapolis-Honeywell Regulator Company, 2706 Fourth Avenue South, Minneapolis, Minnesota.

MINNEAPOLIS-HONEYWELL

Regulator Company

WE CAN FABRICATE THIS EXACTLY AS SPECIFIED AND DELIVER ON TIME

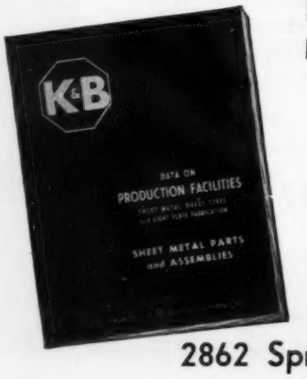
When
KIRK & BLUM

say they can fabricate your sheet steel and light plate work to meet your specifications, you can depend upon it.

With their long record of specialized experience, covering more than a third of a century; with expanded plant facilities and an increased corps of skilled workmen, Kirk & Blum are well equipped to meet definite delivery schedules on single units or quantity production basis.

Many manufacturers sub-contracting their sheet metal parts and products to Kirk & Blum are saving time, money and getting products made the way they want them.

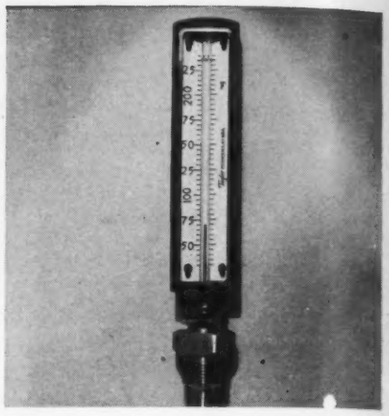
If you have parts or products to fabricate, let's talk it over. Our Engineering Staff is at your service. Consult it for the solution to your particular problem or send us your blue prints for prompt quotations.



"DATA ON PRODUCTION FACILITIES", OUR NEW CATALOG, WILL BE MAILED UPON REQUEST.

The KIRK & BLUM MANUFACTURING Co.

2862 Spring Grove Ave., *Cincinnati, Ohio*



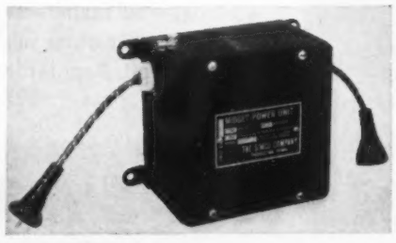
on motors, generators, or reduction gears, small diameter brine, steam, or water lines. One-piece construction eliminates separate front or top caps that might loosen under vibration; sturdy glass front is held solidly in place by a string bezel, yet comes off easily when desired. Two types of separable socket connections are available. Obtainable with straight, angle, right-side angle, left-side angle, or oblique stems to afford best angle position for any location. Taylor Instrument Companies, Rochester, N. Y.

Fluorescent Fixture

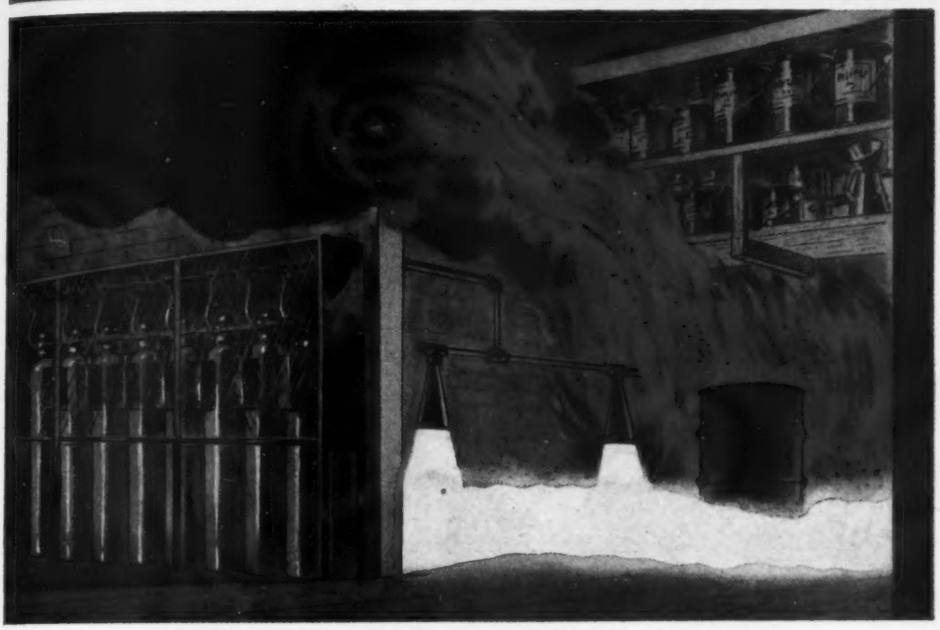
Known as Safirelite, series of fluorescent luminaires is obtainable in styles accommodating one, two, three, or four 40-watt lamps. Designed for either pendant or surface mounting, and equipped with knockouts in each end permitting either single or continuous strip installation in either type of mounting. Fixtures are furnished wired complete with approved sockets, lamp starters, and high power factor ballasts. Lighting Products, Inc., Highland Park, Ill.

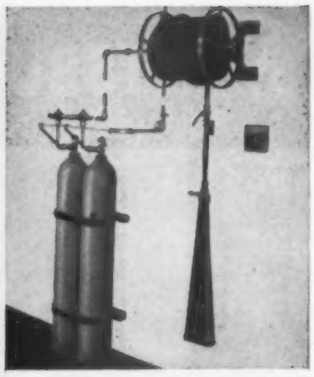
Booster

To meet unusually severe conditions of static electricity the Midget booster has been developed. Mounted in a 6x6x4-in. iron box, it consists of an inductance and a condenser connected in series. There are three connections. One is a binding post to which a wire from a good ground is to be attached. The other two are high-voltage cables, one terminating in the male half of an insulated cord connector, the other in the female half of an insulated cord connector. The connection between the transformer and the neutrostats of the power unit is opened and the Midget booster is connected in the circuit by the insulated cord connectors. May be connected in the circuit or removed readily. When connected, it gives added voltage to the system without increasing the electric



FIRE AND HOW TO FIGHT IT!





GIVES EXTRA PROTECTION

Here's an idea for those fire hazards which are too big for portable extinguishers to handle, yet too small for a built-in system. You'll find a LUX Hose Reel does the trick. A set of LUX carbon dioxide cylinders is hooked up to a length of hose equipped with a special discharge nozzle.

Cargo ships use LUX Hose Reels to guard machinery spaces, boiler rooms. Industry likes these units for small dip-tanks and cooking kettles. Have you this kind of fire hazard?

GET THIS FIRE-FIGHTING GIANT FOR YOUR BIG, TOUGH FIRE HAZARDS

Many fire hazards are simply *too big* for portable extinguishers. Your plant probably has several such danger spots . . . a room where you store flammable liquids . . . a process room . . . a big cooking kettle . . . a dip-tank. These call for up-to-date *built-in protection.*

A Built-In LUX carbon dioxide extinguishing system is engineered to definite fire protection principles. Size and intensity of fire hazard determines whether you need 10 pounds or 10 tons of carbon dioxide in LUX cylinders . . . whether operation must be *automatic,* or *manually* controlled . . . whether one set of LUX cylinders may guard two separate hazard areas. That is *modern "engineered fire protection!"*

That is why LUX Built-In Systems handle big, tough fires with such ease. A flash of flame, a roar of fire . . . then a blast of carbon dioxide gas overpowers the blaze. LUX gas is one of fastest of all extinguishing agents despite fact that it does not harm materials or equipment. And a Built-In LUX System kills fire with brutal efficiency.

FOR ELECTRICAL FIRES

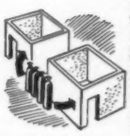
When attacking fires in electrical equipment, never use an extinguishing agent which conducts an electrical charge. LUX carries full Underwriters' approval for use against this type of fire. LUX is safe. Moreover, LUX gas, clean, dry-as-a-bone, does not harm wiring or motors. LUX portables are used to guard small motors. For bigger electrical machinery you'll want a Built-In LUX System. On electrical fires, LUX is a best bet.

LUX SNUFFS OUT FIRE

LUX

Walter Kidde & Company
Incorporated
612 West St., Bloomfield, N. J.

DOES TWO JOBS



Make one Built-In LUX Extinguishing System do two jobs. If it now protects Room "A", you can extend protection to Room "B", too. Install nozzles, detector, piping in "B", with LUX Directional Valves to cover both rooms. Automatic or manual operation directs LUX discharge into either space. Your present LUX cylinders are all you need. That's a real saving!

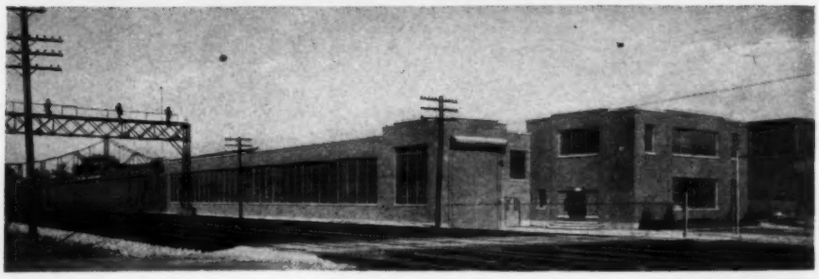
FIRE FEEDS ON CARELESSNESS

As industrial activity steps up, more fires break out in plants. Sound safety practices are often ignored, housekeeping becomes careless when plants are being driven hard. These facts, plus sabotage, get fire off to a fast head start in wartime. Safety experts say—*"Don't get careless. Be even more strict as production increases."* Never let fire get the jump—no matter how busy you are!

READY FOR PUMPERS?

If you have a waterfront location, you can enjoy a real advantage when fire threatens. Fire Department pumpers can go right down to water's edge and get a brand new water supply. *Always have a road or a platform that lets the pumpers get close enough to immerse intake hoses.* This permits extra hose streams, extra protection in vital fire-fighting emergencies.

by PITTSBURGH-DES MOINES



DEFENSE PLANT ADDITIONS

OR ENTIRE

New-Building Projects!

QUICKLY PROVIDED COMPLETE UNDER ONE RESPONSIBILITY AND UNCONDITIONAL SATISFACTION GUARANTEE

If your work is of pressing importance to America's industrial war effort, this Company can build the additions to plant you need — fast, and with dependable fabrication and erection that will keep your structure serving with satisfaction long after victory is won.

For the general picture, write. For immediate consultation — phone or wire our nearest office.

PITTSBURGH-DES MOINES STEEL CO.

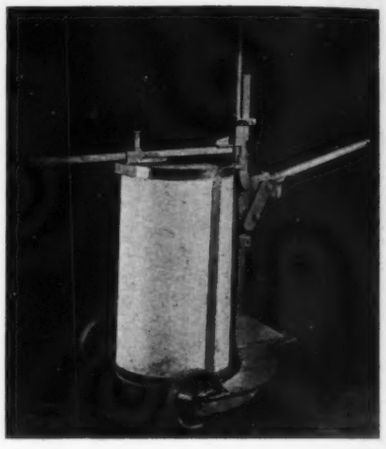
PITTSBURGH, PA. 3458 NEVILLE ISLAND—DES MOINES, IA. 959 TUTTLE ST.

NEW YORK, ROOM 944, 270 BROADWAY . . . CHICAGO, 1262 FIRST NATIONAL BANK BUILDING
DALLAS, 1263 PRAETORIAN BUILDING . . . SAN FRANCISCO, 665 RIALTO BUILDING
SEATTLE, 1166 EIGHTH AVE., SOUTH

strain on the insulation of the power unit. Also, it further decreases the slight shock experienced if accidental contact is made with a point of a static bar. The Sunco Co., 4929 York Rd., Philadelphia.

Drum and Barrel Carrier

Designed to handle light wood, fiber, paper barrels, and "one-trip" light gage steel containers with or without chimes, capacity of Magic carrier is 800 pounds. Carrier accommodates drums and barrels from 14- to 24-in. diameters. Three-wheel construction automatically balances the



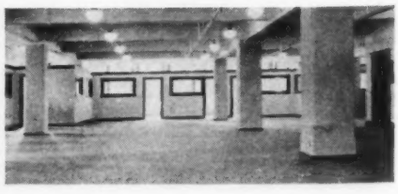
load for safe and easy moving of containers. One man can attach the clamp, pull down on the handle, lift the container off the floor a few inches, and move it any distance. Straight vertical lift of the barrel prevents any flowing over of contents from open-head containers. Ernst Magic Carrier Sales Co., 1456 Jefferson Ave., Buffalo.

Copying Equipment

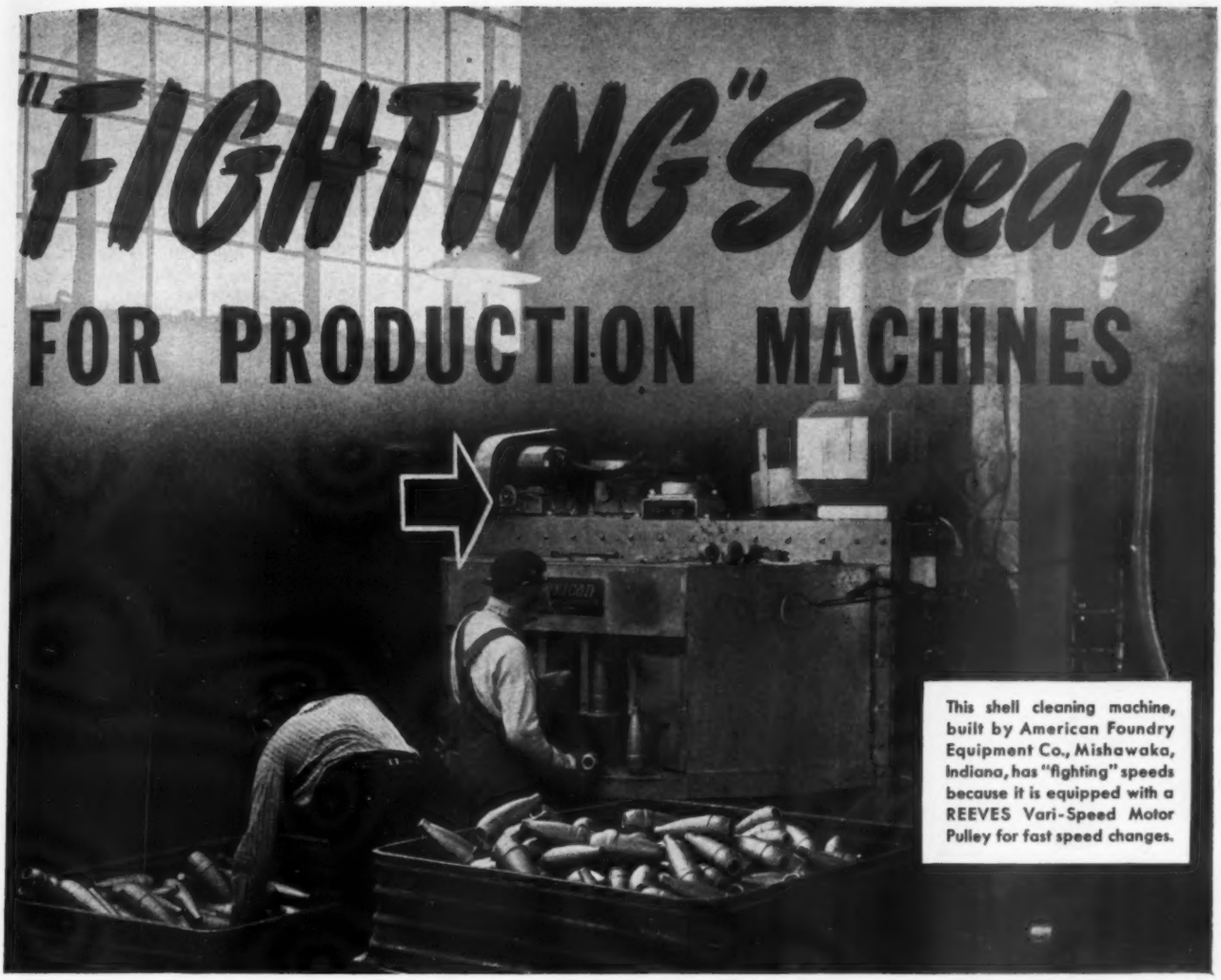
For making accurate copies of letters, contracts, agreements, blueprints, drawings, bills of materials, specifications, without a camera, Apeco is claimed to be efficient and easy to use. Copies anything up to 18x22 inches, needs no darkroom, can make up to 120 copies an hour. American Photocopy Equipment Co., 2849 N. Clark St., Chicago.

Washable Water Paint

Kem-Tone, oilless interior wall finish will shortly be available in all sections of the country except the West Coast. Although Kem-Tone uses water as a thinner, it is not an ordinary water paint. It consists of a water - and - synthetic - resin emulsion. When applied to a wall, two separate drying processes occur. The first, which takes about an hour, is evaporation of the water, which leaves the surface dry to



"FIGHTING" Speeds FOR PRODUCTION MACHINES



This shell cleaning machine, built by American Foundry Equipment Co., Mishawaka, Indiana, has "fighting" speeds because it is equipped with a REEVES Vari-Speed Motor Pulley for fast speed changes.

There isn't much "fight" in a machine that can't change speeds when the need comes. Stodgy, stolid, unresponsive, it just "plugs along"—incapable of being speeded up or slowed down to meet any changed condition.

But give the same machine the complete flexibility—the ability to change pace easily and quickly which comes with REEVES Variable Speed Drives, and watch production zoom!

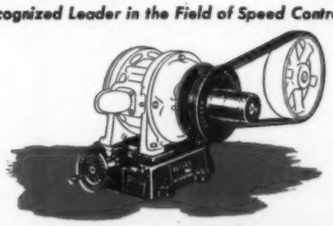
Then work flows smoothly from one machine to another, with speeds synchronized to avoid delays. Each machine operates at the very best speed for the particular job or process, to prevent waste and spoilage. As slow as is necessary for "green hands." As fast as skilled workers can keep up. Faster or slower—but always the best speed—the most efficient speed—as work in process changes size, shape or periphery.

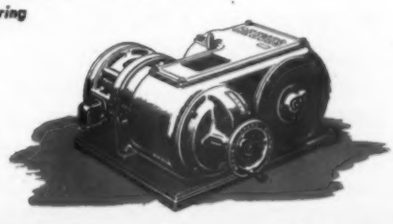
These are the advantages of variable speed control that put more "fight" in any machine. They are the advantages best exemplified in the *infinite speed adjustability, accurate speed setting and positive operation* of REEVES *Variable Speed Drives.*

If you are building a machine that is essential to our war program, write, wire or phone us. We shall do our best to supply you. Send for copy of Catalog-Manual PG-419.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized Leader in the Field of Speed Control Engineering

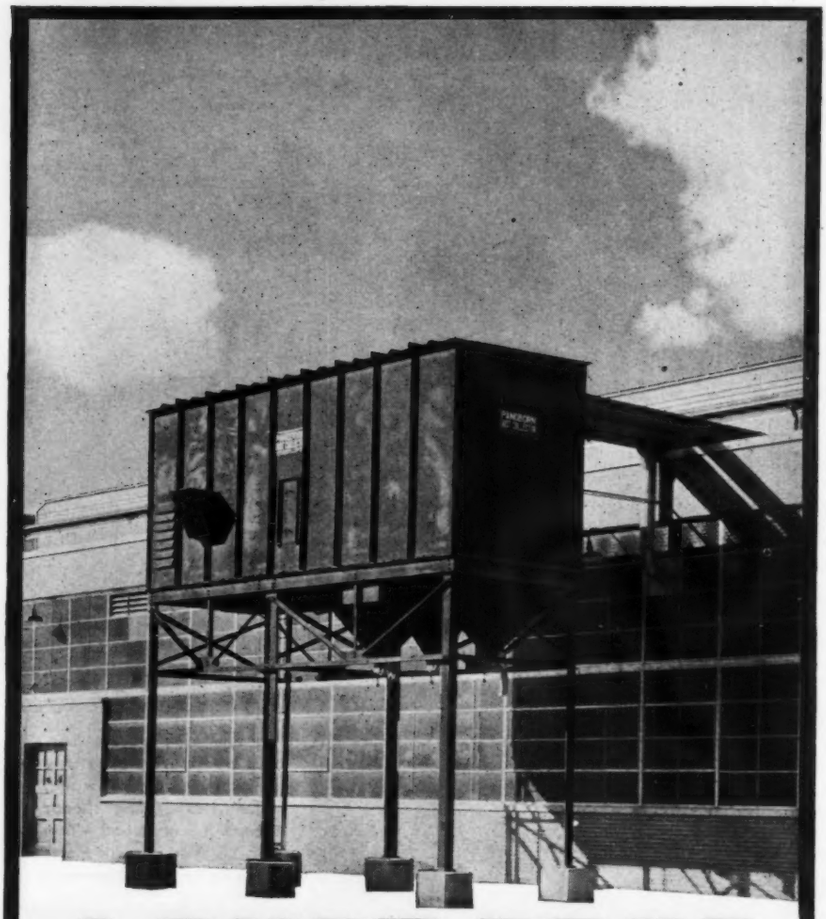




VARIABLE SPEED TRANSMISSION—Provides infinite speed adjustability over wide range and for heavy duty service. Modern open and enclosed designs, vertical, horizontal. Fractional to 87 h.p. Speed variations 2:1 through 16:1.

VARI-SPEED MOTOR PULLEY—Mounts on standard shaft of any constant speed motor. Forms direct drive to machine. For light horsepower requirements to and including 7½ h.p. within 3:1 ratio of speed range.

VARI-SPEED MOTODRIVE—Combines constant speed motor, REEVES speed varying mechanism and reduction gears (where required). Space-saving horizontal and vertical types—¼ to 10 h.p. Speed variations 2:1 through 6:1.



A DUST FREE PLANT

WILL PRODUCE MORE WORK FOR VICTORY!

NOW—more than ever, it is essential to keep men and machines at capacity production by maintaining working conditions at their peak to eliminate lost time.

Pangborn Dust Control systems are doing this job—effectively and economically—in both war and civilian industries. Men, machines and materials are safe from Dust menace when protected with Pangborn installations. A dust-free plant will produce more work for VICTORY. Write.

PANGBORN

WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION · HAGERSTOWN, MD.

touch. It is followed by a process known as "polymerization" in which the actual character of the resin itself undergoes a change resulting in a tough, waterproof surface that is completely washable. This "curing" action takes at least 48 hours. It can be applied directly over practically any type of surface except kalsomine without priming. New plaster walls can be painted without priming or sizing and without waiting for the plaster to dry thoroughly. Other surfaces that can be Kem-Toned without previous preparations include brick, stucco and cement walls, wall and plaster board, and oil-painted surfaces.

Ease of application and good brushing qualities are other properties claimed for this new product. Kalsomine brushes can be used, and lap-marks are no problem. Comes in eight pastel colors, four deep colors, and Yorktown white. Twenty-four additional shades are obtainable by intermixture. Packaged in paste form in quart, gallon, and 5-gal. containers. Sherwin-Williams Co., Cleveland.

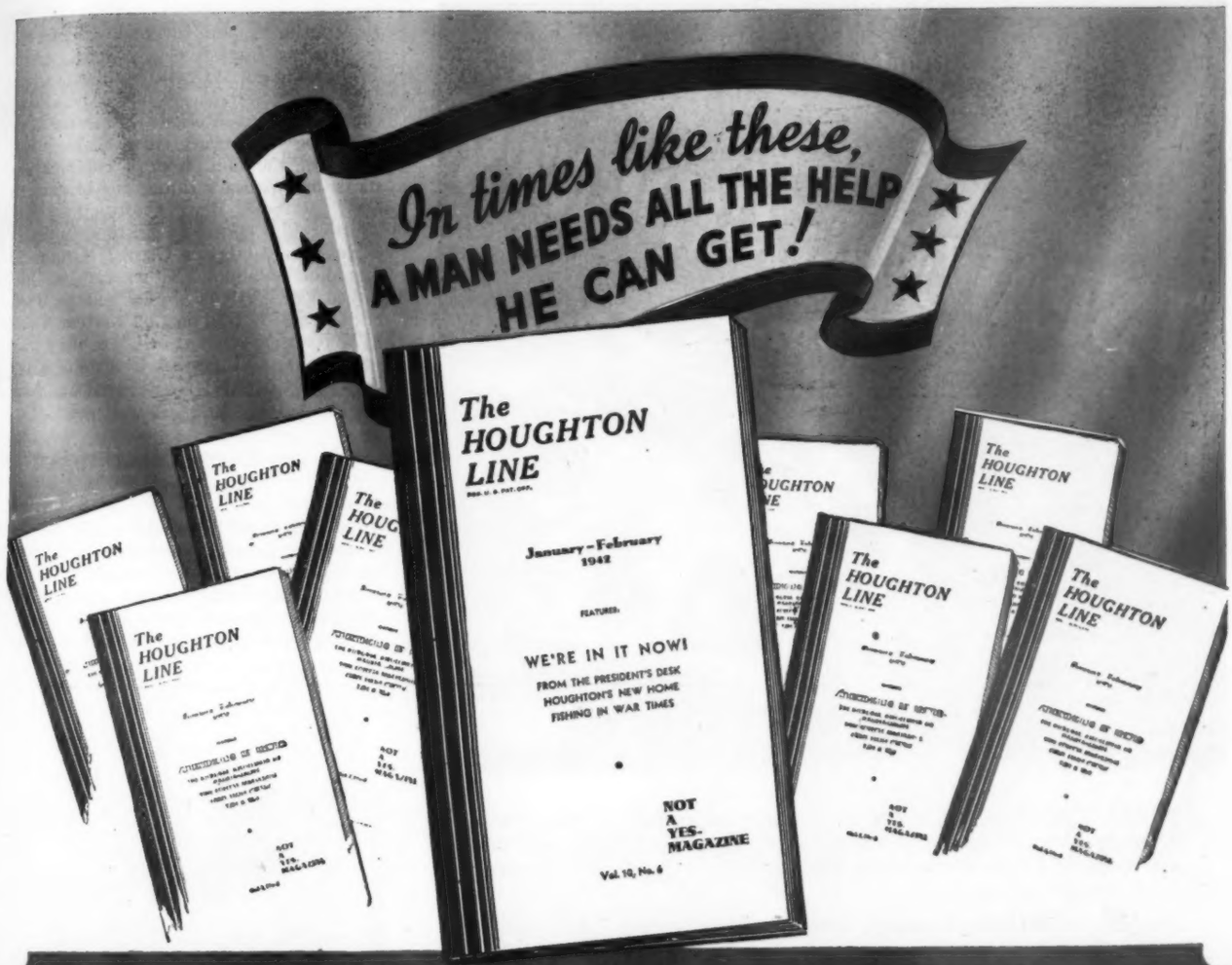
Scales

Advantages incorporated in the series of weight-printing scales include the integration of the printing operation with the weighing mechanism, split-second speed in printing weights, and large easy-to-read weight figures. Printing wheel is a direct

part of the scale, revolving on the same ball-bearing shaft as the scale indicator hand and responding to scale loads in the same manner as the automatic dial scale. This feature is advantageous where materials are weighed on the move, in split-second batching operations, and repeated weighings. Printweigh records may be made in weight sheet or ticket form, continuous paper roll strips, or a combination. Single or duplicate copies. Toledo Scale Co., Toledo, Ohio.

Oil Immersed Starters

Easier installation of oil-immersed starters is provided through a cast head with a wiring manifold that permits conduit entrance from five directions. Removable cover plate facilitates threading bare wire through an insulating spacer above the oil bath. Welded-seam tank is designed for a minimum quantity of oil. Window-type oil-level gage provides quick, clear visibility. Drain cock is recessed in the bottom. Track-type guides prevent swinging, splashing, or accidental collision with the starter panel while the tank is being raised or



CAN *YOU* USE AN EXTRA 77 YEARS OF EXPERIENCE?

As industry changes over from peace-time to war production, plant men face many new problems—machining new steels or new metals . . . cleaning, heat treating, quenching, preventing rust, special lubrication. These problems are covered regularly in the "Houghton Line," which for 34 years has been sent to industrial plant executives the world over.

We believe we can contribute materially in the present emergency, not only with products and service along these lines, but also by increasing the circulation of the LINE to cover more men who have been stepped up to new and unfamiliar responsibilities. If you do not now receive the LINE and would like to enjoy its frank business comment as well as its practical processing articles, sign and mail the coupon below.

Oils and Leathers
FOR THE INDUSTRIES

Manufactured by
E. F. HOUGHTON & CO.
303 W. Lehigh Avenue, Philadelphia
Plants: Chicago, Detroit, Toronto

E. F. HOUGHTON & CO., 303 W. Lehigh Avenue, Philadelphia, Pa.
Gentlemen: Please enroll me to receive the "Houghton Line" regularly without charge or obligation.

Name _____ Title _____
Firm _____
Address _____
City _____ State _____

"I AM HEAT-FAG. I attack workers who sweat — who lose body salt and then don't replace it. Through fatigue and inalertness, I make them 'drop their guard' — I not only spawn . . . I cause accidents."

Heat-Fag is the all-out, unseen enemy of production. Thousands, yes, millions of precious man-hours can be lost through this insidious force that saps men's strength—lowers their efficiency —wears them down before the shift is over. Salt sweated from the body must be replaced — or Heat-Fag takes its toll.

AVOID HEAT-FAG··USE
MORTON'S
SALT TABLETS

QUICK DISSOLVING
(less than 30 seconds)
This is how a Morton Salt Tablet looks when magnified. Examine one—see how soft and porous it is inside. When swallowed whole — with a drink of water, they dissolve in less than 30 seconds.

Wherever workers sweat, Salt Tablets are needed, for they represent the simple, easy way to replace salt that's lost through sweating and hot work.

Case of 9000 10-grain salt tablets, ... $2.60

Salt-Dextrose Tablets, case of 9000 . . . . . $3.15

Order from your distributor—or directly from this advertisement.

Place MORTON'S DISPENSERS at all Drinking Fountains
They deliver salt tablets, one at a time, quickly, cleanly — without waste. Sanitary, easily filled, durable. 500-tablet size, $3.25. 1000-tablet size $4.00

MORTON SALT CO., Chicago, Ill.

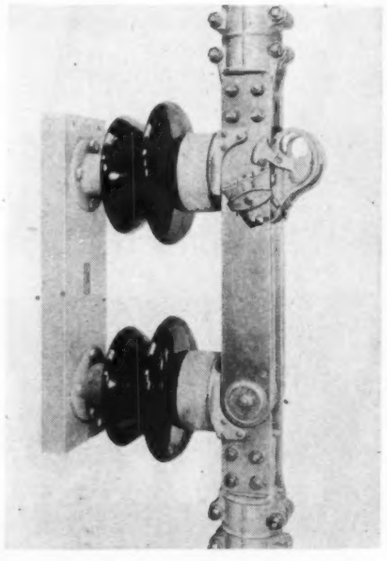
FREE Sample Tube
Write—on your firm letterhead — for a pocket size sample tube of Morton's Salt Tablets and for the new folder — "Heat-Fag and Accidents Ride Together."

EVERYONE WHO SWEATS NEEDS SALT

lowered. Hooks at the bottom of the guide track support the tank in lowered position for inspection. All starter parts are accessible. Magnetic overload relays are easily adjustable to meet prevailing conditions of application. Either hand or automatic reset relays are available. Removal of the tank from a combination starter automatically throws the breaker to "off" position. Two constructions are available, (1) corrosion resisting, and (2) explosion resisting for Class I, Group D hazardous locations. Either can be furnished with Class 8537 line voltage starters; Class 8539 combination starters; Class 8737 reversing starters; or Class 8810 two speed starters. Industrial Controller Div., Square D Co., 4041 N. Richards St., Milwaukee.

Heavy-Duty Disconnect Switches

Known as Type B2-P, 300 amp., 23 kv. hook-stick operated disconnecting switch has high-pressure silver to copper contacts at both blade ends. Design embodies a straight-line current path with current-carrying parts of hard-drawn copper.



Rugged locks and a pressure releasing device are standard equipment. Clamp-type lugs for IPS tubing can be furnished, or switch pads for square tubing or flat bars. Capacities from 2000 to 6000 amps. and up to 34.5-kv. ratings are available. Delta-Star Electric Co., 2400 Block, Fulton St., Chicago.

First Aid Appliances

Stretcher, known as M.S.A. Folding Stretcher, is designed for locations where a compact unit is desired. Only 49 inches long when folded, it is quickly opened to full-sized Army type. Frame is made of selected dry ash, and all metal parts are of malleable iron. Cover is 12-oz. duck. Included in the all-weather dustproof steel case (53 inches long) are the folding stretcher, one wool and one rubber blanket, four wood splints, two chemical hot pads, a 16-unit all-weather first aid kit, and an instruction sheet.

M.S.A. wood traction splint is designed

BULLDOG BUSTRIBUTION DUCT AND TROL-E-DUCT

Plug in for Power and Light at any Desired Point

HERE is a splendid example of how parallel runs of BullDog BUStribution DUCT, *for power,* and Universal Trol-E-Duct, *for lighting,* take all the guesswork out of electrical distribution to specific production line locations.

Each machine is served with power through an individual protective plug — each light is separately fused, and instantly movable. Yet the whole line, including the BullDog equipment, can be rearranged or moved altogether with a minimum of lost time and maintenance cost.

Conversion from peace to war manufacturing, from one armament job to another, or back to peacetime manufacturing later on — all are equally quick and easy with the completely flexible, 100% salvable, prefabricated BullDog equipment.

BullDog pioneered Bus Duct Systems—and sets the pace for the field. Its engineering laboratory leads the way in improvements to increase efficiency and conserve critical materials, such as rubber, aluminum, etc.

To save time, why not let the BullDog Field Engineering Staff — men who have had years of experience in this field — submit complete electrical distribution layouts to your architect or your engineering department. Write today for complete descriptive bulletins.

BULLDOG
ELECTRIC PRODUCTS CO.
DETROIT, MICHIGAN
BullDog Electric Products of Canada, Ltd., Toronto, Ontario

MANUFACTURERS of Vacu-Break Safety Switches, SafToFuse Panelboards, Circuit Master Breakers, Switchboards, Bus Duct Systems—FOR LIGHT AND POWER

How to "UP" Your War-Plant Lighting Levels FAST and ECONOMICALLY!

Wheeler Fluorescent Lighting Layouts save experimenting... give more light per watt!

When war-production demands new high lighting levels in plants, there's no time for cut-and-try experimenting. Specify Wheeler Fluorescent Lighting Fixtures laid out with the backing of Wheeler's 61 years' experience, and you'll get the full specified lighting intensity *economically* . . . from the instant the installation goes to work!

Wheeler Fixtures are engineered to give you production-boosting fluorescent lighting at its best . . . cool, glareless lighting, 24 hours a day, without objectionable flicker. They provide the higher lighting intensities demanded in today's production . . plus the inherent power-economy of fluorescent lamps.

The Wheeler line includes rugged, easily-installed fluorescent units for any plant requirement. Wheeler Lighting Engineers are always available to help you select the best type for your needs and plan efficient layouts.

Write for useful new Bulletin, "Wheeler Fluorescent Lighting Equipment".

• Distributed exclusively through Electrical Wholesalers • Manufacturers of Lighting Equipment Since 1881.

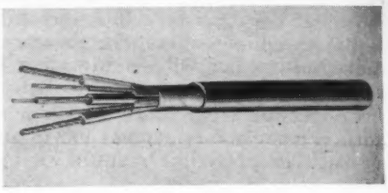
WHEELER REFLECTOR COMPANY
275 CONGRESS ST., BOSTON, MASS.

NEW YORK · CLEVELAND · REPRESENTATIVES IN PRINCIPAL CITIES

for use in supporting fractures of the arms or legs according to the accepted traction method prescribed by the American Red Cross. Made of clear hard maple with chamfered edges and shellac finish, is extensible to 66 inches and telescopes to a compact size that is easy to pack and carry. Quickly adjustable to the patient, the splint is securely locked by bolts with wing nuts and knurled washers. Mine Safety Appliances Co., Braddock, Thomas, and Meade Sts., Pittsburgh.

Bus-Drop Cable

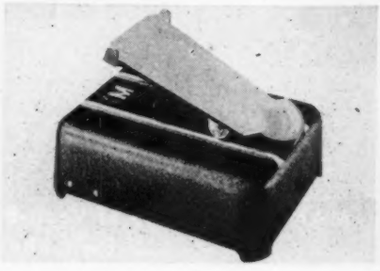
Non-rubber flexible Flamenol bus-drop cable for 600-volt branch circuits enables connection from bus to machine to be made at a saving in installation time and materials, it is claimed. One end of the cable is inserted into a knockout of the plug-in box of the bus system by a squeeze-type fitting. The cable is then run hori-



zontally to a point above the machine where it is looped through, and supported by, a porcelain spool insulator connected by a spring to a supporting wire. The cable then drops, to terminate at the switch box of the machine tool. Cable is resistant to oils and coolants and will not support flame. Is easy to handle, easy to bend, and is resistant to abrasion. Conductors are soft-drawn, dry-bright-annealed, stranded copper, protected by a coating of tin or other suitable material. Each conductor is insulated with the same synthetic as that used on G-E Flamenol wire. Ground wires conform to the same electrical and physical properties as the conductors. The three insulated conductors are twisted together with the ground wires, in combination with dry jute in each interstice, to provide a hard, compact core. Over this core is applied a tape and a jacket over-all of the same synthetic insulation that is used on the conductors. For quick identification, the conductors are insulated in red, white, and black. General Electric Co., Schenectady.

Welding Controller

Arctrol is a foot-operated, variable-resistance unit, designed to vary the excitation current of certain d.c. arc welders. In varying the resistance of the excitation



You Double Your Installation Crew

Without Adding a Man

When You Specify Combination Starters

USERS REPORT INSTALLATION TIME CUT 50%

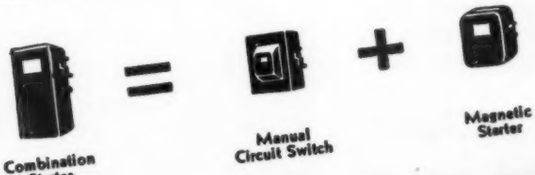
A survey of users shows that they mount G-E combination starters in 50 per cent less time, and wire them in 40 per cent less time.

Here's why . . .

1. You can avoid one complete mounting job on each installation—combination starters combine both a motor switch and a magnetic starter in one unit.

2. Combination starters come to you already wired—only wiring necessary is the connection of power and motor leads.

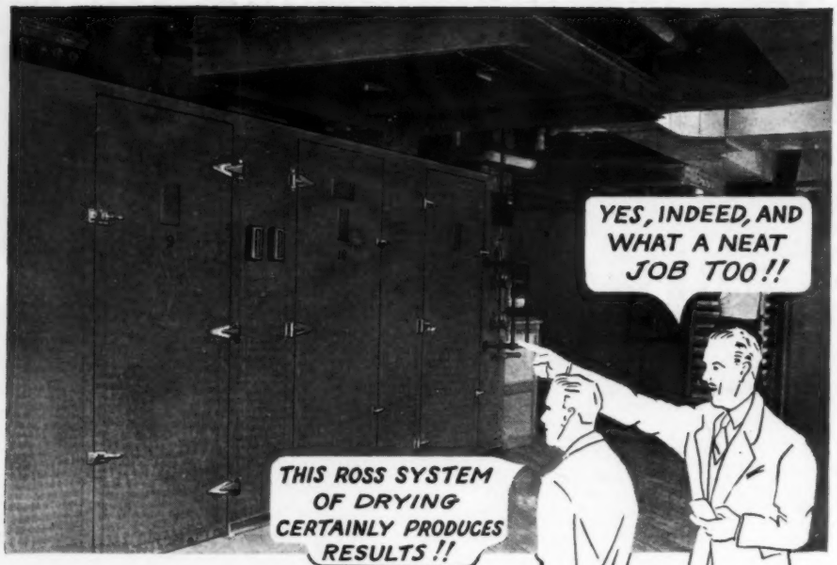
Don't waste time installing two devices where one can do the job. Call your local office and find out all about these starters. General Electric, Schenectady, N. Y.



Regularly furnished for use with motors up to 200 hp.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC



Maintain Your Schedules with Controlled Production

ROSS INDUSTRIAL Air Conditioning and Drying

Today, plant executives are faced with the problem of increasing quantity of production without decreasing standards of quality. In a wide variety of industries Ross Systems are solving this problem—effectively and economically. Designed to provide more rapid and constant treatment of materials they also maintain uniform conditions and unvarying performance.

Whether your process involves cooling, heating, humidification or dehumidification or a combination of all—Ross engineers can design a system to meet your requirements. They invite your inquiry.

Our Bulletin 210 contains valuable information for production executives

J. O. ROSS ENGINEERING CORPORATION

Main Office — 350 MADISON AVE., New York, N. Y.

201 North Wells St. CHICAGO, ILL.

12853 Greeley Ave. DETROIT, MICH.

ROSS ENGINEERING OF CANADA, LIMITED, Dominion Square Building, Montreal

circuit, the output voltage and current of the generator are affected. The resistance unit is especially designed to match the saturation curve of the welding machine to which it is applied. Controller is designed to regulate the generator output from full rated current down to snuffing it out completely. A heavy cast iron case provides mechanical strength to withstand floor abuse. Case size is 9x12x4 inches. A large rugged pedal, similar to an automobile throttle, is provided for operator's foot. Depressing the pedal increases the welding current, and raising the pedal decreases the welding current.

Fifteen feet of 18/2 conductor rubber cord and suitable plug are provided with each unit for connection to the welder. Mullenbach Electrical Mfg. Co., 2300 E. 27th St., Los Angeles.

Insulation

Thin types of Irv-O-Slot have been developed to provide non-bulking slot insulation for use in confined or limited space. Consist of Fish or Spauldo papers coated with resin, or bonded by a plastic insulator,

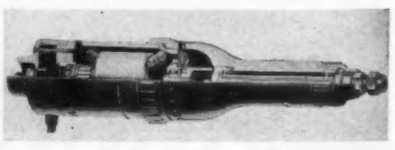
to cambric, silk, or Fiberglas. Possess strength and toughness as protection against mechanical stresses. Have high dielectric strength. The duplexed Irv-O-Slot and Spauldo paper have exceptional heat resistance, it is claimed. Bonded insulations have high moisture resistance. All are flexible and easy to form. Available in sheets and tape form ready to be cut into slot strips. Irvington Varnish & Insulator Co., Irvington, N. J.

Explosion-Proof Thermostats

Available for heating, refrigerating, and air conditioning installations where hazardous conditions exist. Self-contained types are recommended for controlling temperatures of large air spaces, remote bulb types for ducts, walk-in coolers, liquid baths, and the like. External knob or tamperproof internal adjustment available in both fixed and variable differential types. White-Rodgers Electric Co., 1209 Cass Ave., St. Louis.

Electric Tool

Powerful but light electric tool that is capable of grinding, cutting, polishing, engraving has been developed. Suited for exacting internal work in openings as small as 1 to 13/32-in. diameter, to a depth



Switch to Safety

and assure trouble-free operation with the new

(FA) SHUTLBRAK SWITCH

For motor circuits, service entrance, or any installation requiring an operating switch.

Type A, in ON position; door interlocked with handle — fuses not accessible when ON.

This heavy duty industrial switch embodies entirely new *ideas* in design and construction.

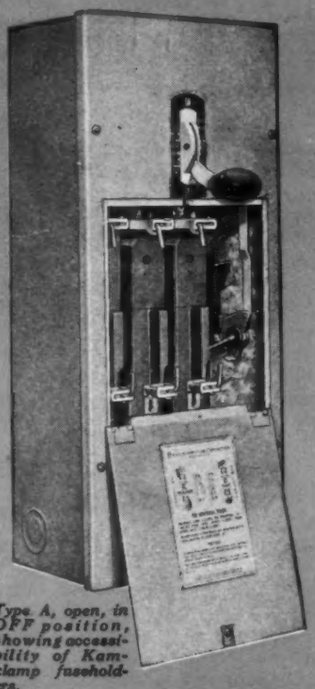
THE roller type main contact and auxiliary contacts are enclosed in an insulated shuttle. This shuttle assembly in turn is entirely surrounded by insulating material. There is an arc resisting barrier *at all times* between the line and load contacts — and contacts are *held under compression* in ON position. Silver plated current carrying parts insure low resistance. Properly engineered springs assure quick make and quick break.

As an additional safety factor, Type A is equipped with an interlocking arrangement between the operating switch lever and the door of the fuse compartment. The door *cannot be opened* when the handle is in the ON position. (Type B does not have this interlocking feature).

Enclosures have ample wiring space at top, bottom and *at rear* of the switching mechanism. Attractively finished in pearl grey enamel.

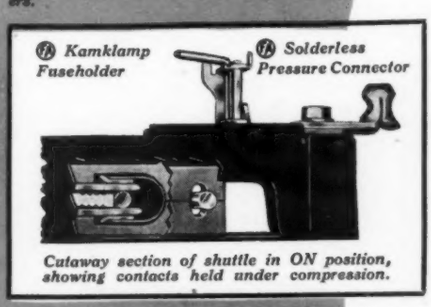
Front operated, the (FA) Shutlbrak Switch may be used singly, banked in groups, or assembled in compact, well designed switchboards and panelboards. Equipped with (FA) Kamklamp (pressure type) fuseholders for either ferrule or knife-blade types of fuse terminals. Also the new (FA) Solderless Type, Pressure Connectors.

Capacities at present: 30 to 400 amp., inclusive, for 250 volts AC or DC, and 575 volts AC, in 2, 3 and 4 poles. (Larger capacities in preparation). Approved by Underwriters' Laboratories as an Enclosed Switch.



Type A, open, in OFF position, showing accessibility of Kamklamp fuseholders.

For detailed information, and suggested specifications for Shutlbrak Switches, Panelboards and Switchboards, write for Bulletin No. 59 . . . Frank Adam Electric Company, St. Louis, Mo.



Cutaway section of shuttle in ON position, showing contacts held under compression.

EST. 1891 THE SIGN OF A BETTER JOB
Frank (FA) Adam
ELECTRICAL PRODUCTS
For Industry
FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

ROEBLING

VARNISHED CAMBRIC CABLE

replaces Heat-Resistant Rubber

THREE CONDUCTOR

SAVE RUBBER—If you are putting cable into rooms that are hot . . . if conductor temperatures are high . . . if cables must withstand temporary overloads and sudden voltage surges . . . specify Roebling Varnished Cambric instead of heat-resisting rubber insulation. Operating temperatures can safely go as high as 85°C, for example, on lines up to 5000 volts.

ABOVE GROUND—If excessive moisture is encountered, cable should be lead encased or enclosed in an extra heavy reinforced rubber sheath. For normal installations a braided covering is satisfactory, the type of finish depending upon service conditions.

SINGLE CONDUCTOR

UNDER GROUND—Must be lead sheathed. If buried directly in the ground or installed in mine shafts, steel tape armor is usually added over the lead sheath. In a bore hole, vertical riser or submarine cable, round wire armor may be necessary.

Single or multiple construction—furnished in all sizes of conductors from 2,000,000 circular mils to 14 AWG in single conductor or 750,000 circular mils to 14AWG in multiple conductor.

Prompt shipment of war orders.

JOHN A. ROEBLING'S SONS COMPANY

TRENTON, NEW JERSEY *Branches and Warehouses in Principal Cities*

of 6 inches. Tool weighs 35 ounces, is powered with Precise universal motor developing approximately 1/7 horsepower at speeds from 35,000 to 20,000 r.p.m. under load. Plugs in anywhere. Simple 3-piece construction. Precise Products Corp. Racine, Wis.

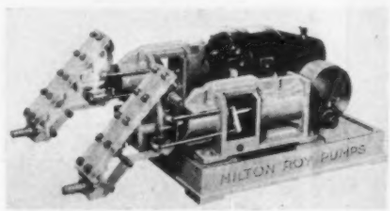
Heavy-Duty Oilproof Aprons

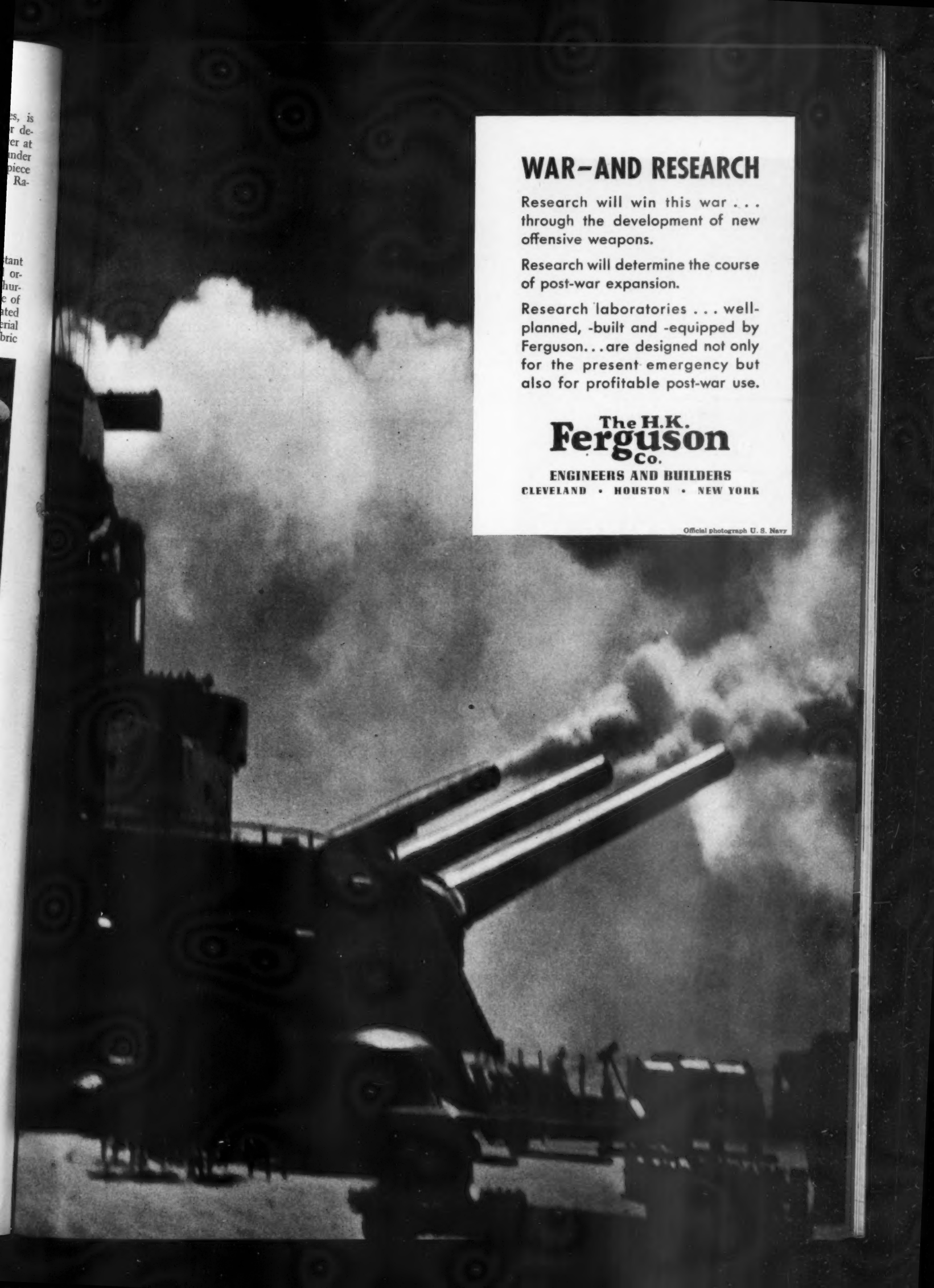
Heavy-duty, abrasion- and tear-resistant aprons which are immune to oils and organic solvents, including insoluble sulphur-base cutting oils, are announced. Made of strong, pretreated fabric, heavily coated with flexible Resistoflex PVA material which retains the flexibility of the fabric

base but renders it impervious to the chemicals and solvents encountered in a wide variety of industrial operations. Aprons afford protection against such widely used solvents as carbon tetrachloride, trichlorethylene, perchlorethylene, banzol, ether, chloroform, ethylene dichloride, paint and lacquer thinners, and animal, vegetable, and mineral oils, as well as carbon disulphide. Available in 22½x35-in. size in the transparent type and 33x42 in. in the heavy-duty type. Resistoflex Corp., Belleville, N. J.

Step-Valve Pump

An improved model plastics pump in which the step-valve and inlet and discharge connections are made entirely from transparent plastics is announced. This pump is recommended for handling alum solutions, hypochlorites, weak acids, mineral and animal oils, and many other liquids, the Plexiglas valve being unaffected by most inorganic solutions and by alkalis and oxidizing acids only in high concentrations. The pump is of typical step-valve design, with double-ball ground glass checks and adjustable stroke for accurate control of volume from one quart per hour





WAR–AND RESEARCH

Research will win this war . . . through the development of new offensive weapons.

Research will determine the course of post-war expansion.

Research laboratories . . . well-planned, -built and -equipped by Ferguson. . . are designed not only for the present emergency but also for profitable post-war use.

The H.K. Ferguson Co.

ENGINEERS AND BUILDERS

CLEVELAND • HOUSTON • NEW YORK

Official photograph U. S. Navy

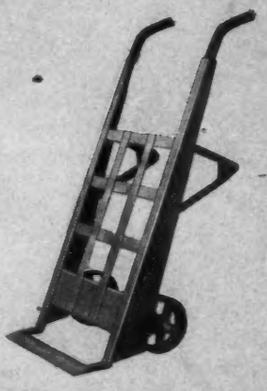
DESIGNED FOR
PEACE
BUT SERVING IN
WAR

COLSON PRODUCTS are peacetime equipment. But because each Colson item is designed to *keep things moving*, Colson now serves vital production that must meet the needs of war.

So, throughout the arsenals of democracy, you'll find Colson equipment working day and night helping to speed arms and ammunition to the forces at the front.

COLSON UNIVERSAL DRUM TRUCKS The fastest, safest means of handling any barrel or drum. No lifting in either loading or unloading. Rugged, all-steel, welded construction that stands hard, continuous use.

COLSON CASTERS FOR EVERY PURPOSE—Big, husky sizes for loads up to 1500 pounds per caster. Smaller sizes, too, in over 2000 different models—A CASTER FOR EVERY PURPOSE.



TRUCKS AND PLATFORMS that move materials and parts—easily, quickly. The Colson line has a wide range—hand trucks, tank trucks, rack trucks, platform trucks, and special models of a wide variety. All equipped with long-wearing, easy-rolling Colson casters or wheels.

THE COLSON CORPORATION
ELYRIA, OHIO
Offices and Agencies in Principal Cities
Casters • Industrial Trucks and Platforms • Lift Jack Systems • Bicycles • Children's Vehicles
Wheel Chairs • Wheel Stretchers • Inhalators • Tray Trucks • Dish Trucks • Instrument Tables

up to maximum capacity. Duplex models will handle up to 100 g.p.h., Simplex models up to 50 g.p.h., against pressures as high as 150 pounds per square inch.

Single-piece cover plates for plastics valve are readily removable without disturbing connections, and the manufacturer states that this valve is non-clogging, self-cleaning, and eliminates all possibility of air-binding. The transparency of the plastics material makes it possible to watch the pump function and to detect discoloration or dirt particles in the liquid as it passes through the valve. Milton Roy Pumps, 1300 E. Mermaid Ave., Philadelphia.

Photoelectric Control

Photoelectric control especially designed for turning off protective lighting during blackouts has been announced. Light Watchman is a photoelectric relay which is actuated by the nearest street light. When the street light goes out, the photo-

electric relay turns off the lights. When the street light goes on again, the controlled lights are again energized. A short time delay prevents false operation of the relay by momentary flickering of street lights. Relay is so designed that if either of the two tubes fails, or if the sensitive relay coil is open-circuited, the relay is de-energized and the lights are turned off. Available in indoor or outdoor types. General Electric Co., Schenectady.

Dust Control System

Among the advantages claimed for the down draft system of dust control is that dust is carried off through ducts constructed under the floor, which saves floor space and does not obstruct working areas. Bench-high gratings, through which air is exhausted, enable operators to handle castings for sanding, snagging, grinding, polishing, and buffing. It is possible to grind and sand castings within a few feet of precision machinery without partitions or curtains. All dust particles are carried down

Big ones and little ones
General purpose motors, fan cooled, explosion proof, splash proof, gearhead, unibrake, speedranger . . . millions and millions of types and ratings of Master Motors. And any of these can be supplied in standard construction or easily and economically modified to fit EXACTLY the individual requirements of each job.
You'll find that Master Motors, built to meet the individual requirements of each job, can help you step up your production and greatly improve the economy, safety, and convenience of your plant equipment or motor driven products.
Investigate the unusual ability of the Master organization to help you with your part in the Victory program.
THE MASTER ELECTRIC COMPANY • DAYTON, OHIO

HAVE YOU A *Problem in*

Capitalize the Service of the Carey REPRESENTATIVE

Today, more than ever—the big job of the Carey representative is *serving* industry. His time for the duration is dedicated to helping you attain utmost economy in plant maintenance—top efficiency in plant operation.

Every Carey man is thoroughly trained from the ground up in the use and application of Carey Products. Representing one of the oldest and largest manufacturers of roofing, waterproofing and insulation materials in the country, he is qualified by experience to make practical recommendations.

Capitalize this Carey service when our representative calls on you. Whatever your needs, you'll find that he will do everything humanly possible to be of real help in analyzing your problems and in finding the economical answers. For details address Dept. 31.

Carey PRODUCTS INCLUDE:
BUILT-UP ROOFINGS • ROOF COATINGS
HEAT INSULATIONS • CAREYDUCT
INDUSTRIAL ASPHALT FLOORING
ASPHALT ROOFING & SHINGLES
ROCK WOOL INSULATION
ELASTITE EXPANSION JOINTS
ASBESTOS-CEMENT CORRUGATED ROOFING & SIDING

THE PHILIP CAREY MFG. COMPANY
Dependable Products Since 1873
Lockland, Cincinnati, Ohio
In Canada: **The Philip Carey Co., Ltd.**
Office and Factory: **Lennoxville, P. Q.**

through the gratings as fast as they are released. These surface gratings and under-the-floor ducts help maintain a clear atmosphere. Kirk & Blum Mfg. Co., Spring Grove Ave., Cincinnati.

Concrete-Floor Patching

Smooth-On No. 7B Quick Patch Cement has been developed for quick patching of cracks, ruts, and shallow holes in concrete floors. Hardens quickly and adheres firmly to the surfaces with which it is in contact. Has an iron base, so that it is wear-resistant as well as dustproof, oilproof, and waterproof. Patches harden overnight, permitting full traffic the following morning, and become stronger with age, it is claimed. Smooth-On Mfg. Co., Dept. 397, 570 Communipaw Ave., Jersey City, N. J.

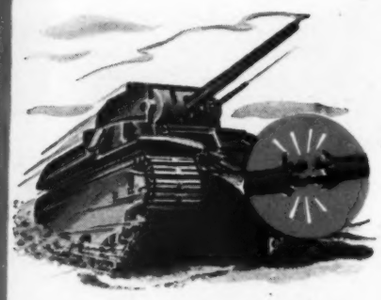
Covers for Ball and Roller Bearings

Standard covers for ball and roller bearings, in a complete range of types and sizes, have recently been developed for forming a dust- and grease-tight closure to

the bearing housing. Saving costly "nuisance" set-ups, reduction in designing, drafting, detailing, and checking time as well as elimination of the costs of patterns, fixtures, gages, are claimed as chief advantages. R-S Products Corp., 4530 Germantown Ave., Philadelphia.

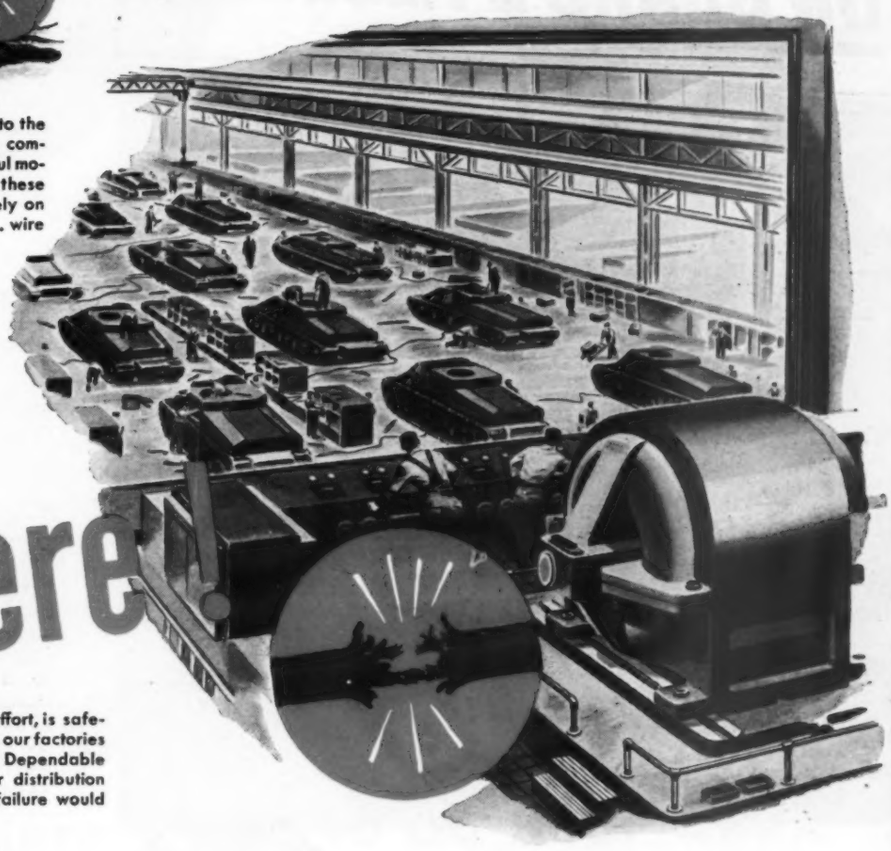
Solenoid-Operated Lubricators

Solenoid-operated lubricators, utilized in connection with centralized automatic lubricating systems, are finding uses where semi-isolated units of a special machine are to be lubricated. Solenoid-operated lubricator pump mounted on cover-plate is completely accessible by removing this plate. Pump-and-reservoir unit, together with branched oil feed-line, junctions, and meter-units at the bearing surfaces, comprise the lubricating system. A switch is connected to one of the machine slides, which energizes the solenoid on the return stroke after completely machining the work. At the end of the return stroke,



They can't let it happen here!

Electrical power is all-important to the ponderous tank . . . for its radio communication system, for its powerful motor ignition. To transmit current for these vital functions American tanks rely on wires and cables of copper . . . wire failure might be serious.



or here!

Important too, to America's war effort, is safeguarding the power that enables our factories to turn out our formidable tanks. Dependable wires and cables are used for distribution of electrical power . . . for wire failure would interrupt production, itself.

ELECTRICAL WIRES AND CABLES OF COPPER ARE THE LIFE LINES OF OUR NATION

Today . . . Anaconda Products are pre-empted for the toughest wiring jobs in war production. Anaconda Wire & Cable Company is devoting its production wholeheartedly to our war effort . . . turning out the most modern types of copper wire and cable, engineered to fit the job . . . and doing it *seven days a week!*

Meanwhile . . . Anaconda Wire & Cable Research carries on: Working with redoubled effort are the research laboratories of the Company . . . investigating and testing materials and methods . . . improving existing products, developing new ones.

The benefits of this intensive program of original research today are going into our country's war effort. But when the emergency is ended they will be available to industry everywhere . . . a pool of practical information, of product development and improvement . . . even finer wires and cables of copper. 42236

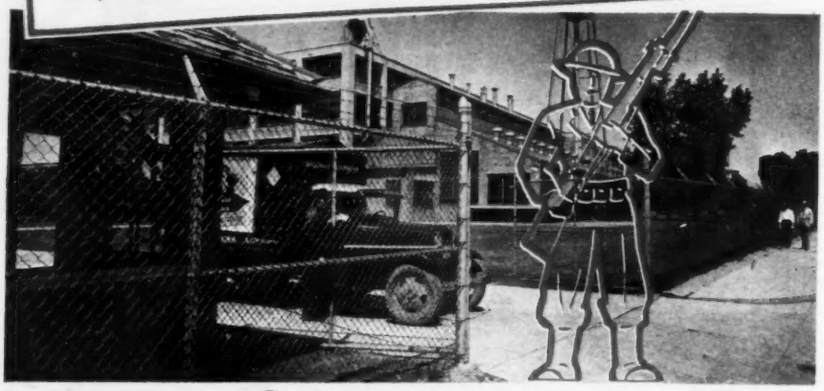
ANACONDA
from mine to consumer

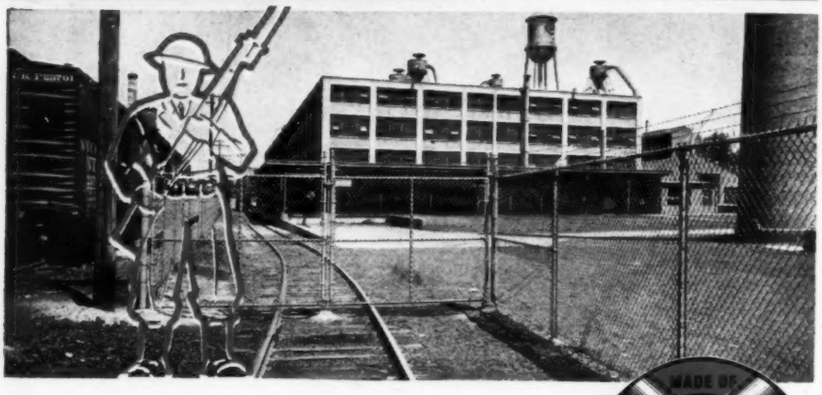
This familiar trade-mark symbolizes the best efforts of modern research and production.

GENERAL OFFICES: 25 Broadway, New York
CHICAGO OFFICE: 20 North Wacker Drive
Subsidiary of Anaconda Copper Mining Company
Sales Offices in Principal Cities

ANACONDA WIRE & CABLE COMPANY

CONTINENTAL *Chain Link* FENCE
ON GUARD 24 hours a day





For modern industrial plants, fence protection is a vital necessity. Fence guards at vital points, day and night. It helps assure uninterrupted production. It controls entrance and exit of all persons. It lowers insurance premiums.

CONTINENTAL specializes in modern chain link fence for industrial plants and essential properties. The wire used in Continental fence is made of steel produced in our own furnaces which means that every step, from mixing and melting the steel to weaving the finished fabric, is controlled and personally certified as to quality by our own metallurgists and skilled workmen.

Only Continental Chain Link Fence has fabric made of KONIK* steel for extra strength and rust resistance. Continental Fence is designed for your particular site and factory built for quick erection by trained crews.

*(*During the war emergency KONIK will not contain standard amounts of copper, nickel, and chromium.)*

Representatives and Distributors in Principal Cities

FREE FENCE MANUAL

Send for "Modern Property Protection"—This manual has 100 charts, drawings, photographs giving complete data for fencing property. Write to the—

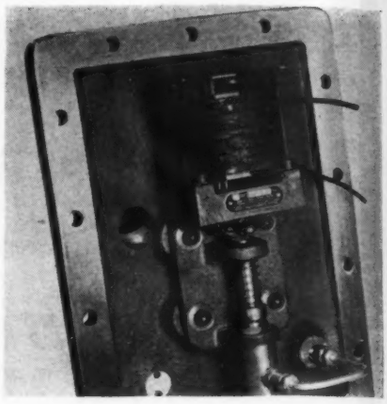
Continental Steel Corp.
Kokomo, Indiana

CONTINENTAL SUPERIOR STEEL

CONTINENTAL
STEEL CORPORATION

SHEETS: Black, Galvanized, Copperior, Hot and Cold Rolled, Special Coated, Long Terne, etc.

WIRE: Bright Basic, Annealed, Coppered, KONIK, Tinned, Special Manufacturer's, etc.



the current to the solenoid is automatically shut off, the lubricator pump piston descends, and oil is delivered through the distribution feedline tubing to the eight meter-units. Each meter-unit feeds a predetermined quantity of oil to the bearing surface it serves. Adaptable to any machine layout. Meter-units can be located at any distance, height, or level in relation to lubricator position. Bijur Lubricating Corp., Long Island City, N. Y.

Industrial Gloves

Synthetic "7" rubberized fabric glove has just been announced. Lined with a sturdy, napped canton flannel of top quality. Liquidproof and will not snag. Resistant to oils, greases, solvents, acids, caustics, corrosives, and severe abrasives, it is claimed. Available in knit-wrist style, and the gauntlet type in 10, 12½, 14½, and 18-in. over-all length. Edmont Mfg. Co., 545 Orange St., Coshocton, Ohio.

Weld Spatter Eliminator

Acme Industrial Finish Flash-Off No. 99 is designed to eliminate weld spatters and the time cost of removing them, plus giving a stronger, smoother weld. A mechanic brushes, sprays or wipes on Industrial Finish Flash-Off along the edges of the metal surfaces to be joined by the weld. Then when the welding is done, metal chips bounce or fall off instead of adhering to areas adjacent to the seam. An additional feature claimed is the cleansing effect to the surface to which applied. Prevents pitting on galvanized or ungalvanized metal surfaces, and permits immediate application of paint without cleaning operations other than wiping off. To be marketed in 55-gal. drums and 5-gal. cans. Acme White Lead and Color Works, Detroit.

Solvent-Resistant Paint

Protective paint, designed expressly for protection of fumigating equipment and similar inclosures where destructive fumes are involved, is announced. Supplied in the form of a primer and a finished coat, Resistoflex paint was developed particularly for coating and gasproofing wood, beaverboard, and composition fiber building boards of all kinds, forming an impermea-

Here's a 48 to 60 hour week —by working 40 hours!

Everybody says our greatest shortage in the war program is TIME. Here's how to get the welding output of 48 to 60 hours with no more effort and no more time than 40 hours.

ALTER EGO: And how simple! Just select the proper electrode, use the new "Fleet-Fillet" Technique, boost the current—then speed like blazes!

Speed is right! At 50% operating factor, I used to make 15 feet per hour on these 3/8" fillets. Now, with this new "Fleet-Fillet" Technique, I'm getting 30 feet per hour. Twice as fast!

ALTER EGO: And look at the weld metal you save! All in all, the boss says this new technique has cut welding costs more than 50%.

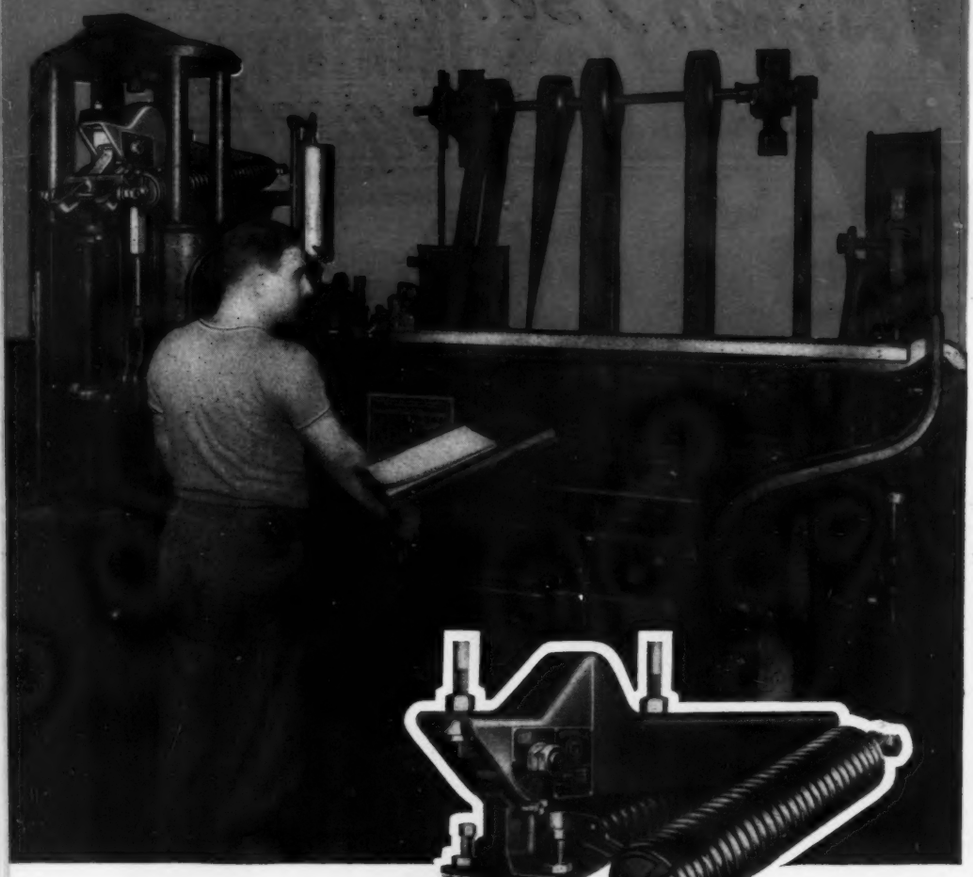
That's why every welder, supervisor, engineer and executive in metal-working industries should air mail a letter to The Lincoln Electric Company, Cleveland, Ohio, for their book on the new "Fleet-Fillet" Technique so that they can put this time saver to work for Uncle Sam at once.

Free copy "Fleet-Fillet" Bulletin No. 432 on request.

THE LINCOLN ELECTRIC COMPANY
CLEVELAND, OHIO

ALTER EGO: Literally, "one's other self"—the still, small voice that questions, inspires and corrects our conscious action.

PRE-FITTED to Your Installation!



Here's the "fitting room" for GENSPRING Hangers . . . a machine that duplicates actual-service conditions!

GENSPRING CONSTANT-SUPPORT HANGERS...

are individually calibrated for each job!

There's no chance of misfits in the hangers for your power piping . . . no delays for "fussy" calibrations, . . . when you specify GENSPRING Constant-Support Hangers!

Every GENSPRING unit is *pre-fitted* before shipment . . . tested and calibrated under load-and-travel conditions that duplicate actual-service specifications. Yet, field changes up to ±16% of rated hanger load may be made after installation with the simple adjustment built into each hanger.

These are only two of the advantages of "floating" pipe-suspension by GENSPRING Hangers. Through unique engineering design, these hangers provide constant support for piping in every "hot" and "cold" position. The weight of pipe is always balanced . . . transfer of vertical vibration to the pipe is eliminated . . . the safety factor of the complete system is effectively maintained. And *all* in minimum headroom!

Get full details of GENSPRING Constant-Support Hangers for loads from 250 to 8500 pounds. Costs are moderate due to mass production and interchangeable parts. Grinnell Co., Inc., Executive Offices, Providence, Rhode Island. Branch offices in principal cities of United States and Canada.

WRITE FOR complete Data Book on GENSPRING Hangers containing piping-travel calculations.

GENSPRING CONSTANT-SUPPORT HANGERS BY

GRINNELL

WHENEVER **PIPING** IS INVOLVED

ble film unaffected not only by fuels, oils, and organic solvents, but also by fumigating gases. Supplied in 1-gal. containers, and 10-, 20-, 30-, and 50-gal. drums. Resistoflex Corp., Belleville, N. J.

Fluorescent Lighting Unit

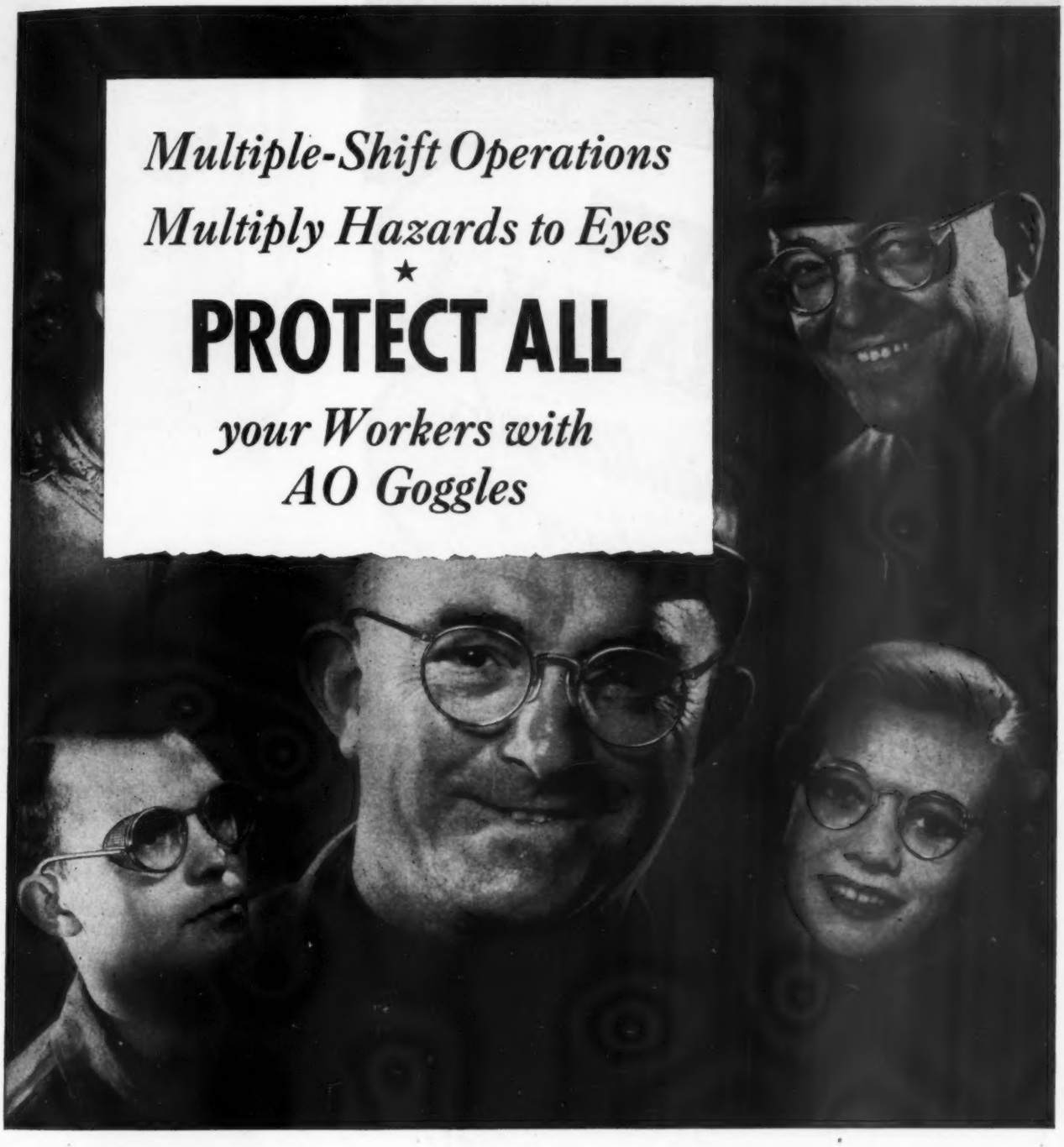
Plastic unit with a steel top plate and plastic diffuser, known as PlastiLux, primarily for use in offices, is announced. Designed for installation in continuous lines or for individual units, to be mounted

either directly on the ceiling or suspended. Knockouts are provided in the top plate to aid installation. The outer surface of the top steel plate acts as a reflecting surface and has a Fluracite finish for maximum efficiency. Wired complete with 110, 120-volt high power factor ballast. Plastic shield is easily removed by applying slight pressure along the sides. Starters, located at the sides of the reflector, are accessible. Reflector forms the cover of the wireway and conceals the lamps. Is easily removed by releasing two wing nuts. Curtis Lighting, Inc., 6135 West 65th St., Chicago.

Constant Level Lubricator

Oil-Rite constant level lubricator holds a visible reserve supply of oil—releases automatically just as much as is needed to maintain a constant predetermined level of lubricant. Its use is said to (1) insure adequate lubrication at all times and (2) prevent oil waste, and the deterioration or spoilage of material caused by oil throw. Used on electric motors, pillow blocks, textile and paper making machinery, pumps, air conditioning equipment, ventilating fans, gearboxes.

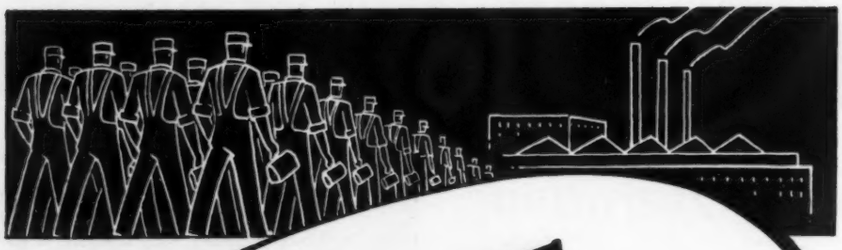
Consists of three simple parts. The base is cast of Zamak metal, with an integral open-air vent which extends part way up into the oil reservoir. Over this vent is fitted loosely an inverted bucket or bell. The reservoir proper is a glass dome,



Remember this: as the size of a working force increases, the possibility of eye accidents increases. Eye protection must keep step with employment. All workers, especially *new* and *inexperienced* ones should be given the right type of goggles for their work.

Put a complete eye protection program in your plant *now*. American Optical Company can help you — with a complete line of safe, comfortable goggles and cooperation to make your eye safety program effective.

THE American Optical COMPANY
SOUTHBRIDGE MASSACHUSETTS



OAKITE DEODORANT No. 1

does 3 sanitation jobs in 1 operation!

DEODORIZES!

CLEANS!

DISINFECTS!

Because working forces in so many plants are increasing enormously . . . because washroom, lavatory and similar facilities are being used to the limit . . . maintenance men daily are confronted with such pressing problems as . . .

How can required sanitation standards be maintained more easily and economically?

How can employee health be protected and infection prevented more effectively?

You, too, will find the right answer in Oakite Deodorant No. 1. This TRIPLE-ACTION material DEODORIZES, CLEANS and DISINFECTS . . . ALL in ONE operation! It effectively destroys odors . . . quickly removes all dirt . . . disinfects surfaces to which it is applied. Gives you high sanitation efficiency at low cost.

ONLY A FEW PENNIES A GALLON!

Oakite Deodorant No. 1 costs only a few pennies a gallon . . . pays for itself through the time and work it saves and the results it provides. Try it in your plant. See for yourself how it works, what it does! Available in 45-lb. containers. Write for complete descriptive folder, FREE for the asking.

OAKITE PRODUCTS, INC.
14A THAMES STREET, NEW YORK, N. Y.
Representatives in All Principal Cities of the United States and Canada

8 Advantages Oakite Deodorant No. 1 Gives You!

- ☆ Highly effective for washrooms, lavatories, shower stalls, locker and first aid rooms, etc.
- ☆ Instantly soluble in COLD water. Hot or warm water unnecessary.
- ☆ Odorless itself, it does not "cover up" or mask one odor with another.
- ☆ No need for rinsing after applying. Simply mop up.
- ☆ Saves time, money. Deodorizes, cleans, disinfects all in ONE operation.
- ☆ An effective health measure, it guards against infection.
- ☆ Economical . . . costs only few cents to make gallon of solution.
- ☆ Safe to use, easy on the hands.

OAKITE MATERIALS . . METHODS . . SERVICE — Specialized — **CLEANING** FOR EVERY CLEANING REQUIREMENT

sealed to a metal collar by plastic porcelain cement which is impervious to acids, oils, water, and heat. Two spring clips lock the oil reservoir in position. A felt gasket around the outside of the bell seats against the narrower neck of the glass dome when the reservoir is removed, prevents waste of oil during refilling.

Available in four standard sizes, with capacities of 2, 4, 8, and 16 ounces. Outlet tappings are provided at both side and bottom of base, and oil level to be maintained is clearly indicated. Air vent can be provided with filter if desired, or can be installed with breather tube connecting to bearing. Oil Rite Corporation, 3466 S. 13th St., Milwaukee.

Luminaires for Protective Lighting

For lighting industrial fences and areas for protection against sabotage, two types of Fresnel luminaires are available—SF-180 and MF-180, for series and multiple circuits respectively. Units can be mounted on poles and building walls. Consist

basically of hood with socket and receptacle, mounting bracket, reflector, and lens assembly. Hood is made of cast iron. Lower part of the casting has a flange for watershed and breather to avoid creation of a vacuum due to sudden cooling of the luminaire by rain. Moistureproof felt gaskets form a weatherproof and bugproof

seal between hood and reflector. Units with side mounting plates are gasketed with graphited asbestos, Westinghouse Elec. & Mfg. Co., E. Pittsburgh.

Hand-Wiping Solvent

Hand-wiping safety solvent to be marketed as a replacement for naphtha, gasoline, and kerosene is applicable for wide industrial use as a naphtha substitute for grease-cleaning and hand-wiping operations. To be marketed under blanket

trade-mark of Gunk XP-92; to be used as a concentrate and to be diluted with water. Described as a unique safety solvent because, in spite of its high solvency against mineral oil or dirt, it is claimed that it does not de-oil the skin, has no toxic vapors, no flash or fire point, and leaves an invisible rust preventative film. The Curran Corp., Malden, Mass.

Alarm Control

Photoelectric blackout alarm control has been developed to provide a warning signal inside factories in the event of an air raid. In many cases, because of the din of machinery, it is impossible to hear external air raid warning sirens. The Photoswitch control is placed in a convenient location so that it views a centrally controlled street lamp. Through the photoswitch are connected alarm systems operating inside the factory and when the street lights are turned out, Photoswitch observes it and the alarm is sounded. Control is designed to operate independently of a momentary flickering of the street lamp and of ambient light conditions. Photoswitch Inc., 21 Chestnut St., Cambridge, Mass.

Load-Center Unit Substation

Standardized load-center unit substations, available in sizes ranging from 100 to 2000 kva., are compact, coordinated, factory-built units that can be installed anywhere in industrial plants or power distribution centers, saving headroom, floor space, and long secondary runs of heavy

Wash-up strategy helps speed production

LAN-O-KLEEN* offers far-sighted management a real PLUS value in promoting employee good will and fighting dermatitis. Unlike harsh soaps, LAN-O-KLEEN is an effective hand cleanser which acts TWO ways. First, it gently removes 95% of all soils encountered in industry. Then it *"Work-Conditions"* the hands.

For Lan-O-Kleen is a soap with a corn-meal base, impregnated with pure LANOLIN. Thus Lan-O-Kleen puts back on the hands an oil almost identical to those secreted by the glands in the skin. This helps nature to maintain a normal, healthy skin condition. And healthy hands are less liable to become infected.

THINK IT OVER! Is it worthwhile to improve the condition of working hands—provided your soap cost is no more than it is now? There's a quick way to find out! Clip this coupon to your business letterhead . . . AND TRY LAN-O-KLEEN YOURSELF. You'll find it worthwhile.

For Workers in Contact with Skin Irritants West Manufactures a Complete Line of SKIN-PROTECTIVE CREAMS

after formulae especially created to meet certain conditions. Our home and branch office staffs will be glad to discuss your needs for a standard or custom-made product of this kind.

*Trade Mark Reg. U. S. Pat. Off.

WEST DISINFECTING COMPANY

SERVING AMERICAN INDUSTRY FOR OVER 50 YEARS

55 BRANCHES Coast-to-Coast and in Canada

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WEST DISINFECTING COMPANY
Dept. J, 42-16 West Street, Long Island City, N. Y.
Please send me your latest bulletins on
( ) Lan-O-Kleen Hand Cleaner
( ) Wescol ( ) Protective Creams
Name _____ Title _____
Name of Company _____
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City and State _____

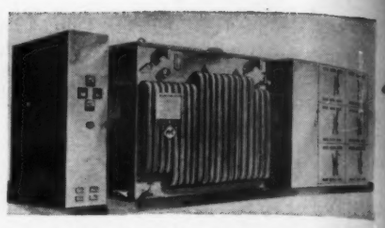
IF YOU WISH COPIES OF THE COLOR POSTER SHOWN IN ABOVE PHOTOGRAPH, USE COUPON AND CHECK ☐ HERE

THIS NON-SKID
FLOOR PATTERN
grips in any direction
SAFETY and comfort underfoot are assured by the unique, patented design of U·S·S Multigrip Floor Plate. Over fifty risers under each foot give positive traction. The flat-topped lozenges provide smooth rolling for trucks as well as comfortable walking for workmen. The arrangement and sloped sides of the projections allow easy, quick cleaning. An installation of Multigrip Floor Plate gives protection for years with no maintenance costs.
U·S·S Multigrip Floor Plate is supplied in greater widths than any other type of floor plate, permitting fewer joints and lower installation costs. The availability of U·S·S Multigrip Floor Plate depends upon the priority rating of your work.

U·S·S MULTIGRIP FLOOR PLATE

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

UNITED STATES STEEL



copper. Flexible, they offer a wide choice of incoming- and outgoing-line arrangements. The substation consists of a metal-inclosed incoming-line section, a throat-connected transformer, and a low-voltage feeder section.

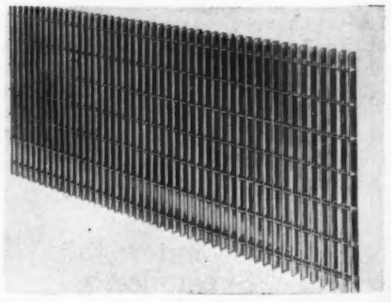
On the high-voltage side potheads, disconnect switches, oil fuse cutouts, metal-clad switchgear, or direct connection through terminal box can be supplied. On the low-voltage side, stationary or drawout air breakers, electrically or manually operated, are furnished. Transformers can be oil-immersed, dry type, or non-inflammable Chlorextol-liquid filled. Installation is quick and easy—the two or three component sections shipped from the factory are simply throat-connected and power leads attached. Available for either indoor or outdoor service. Allis-Chalmers Mfg. Co., Milwaukee.

Quenching Crane

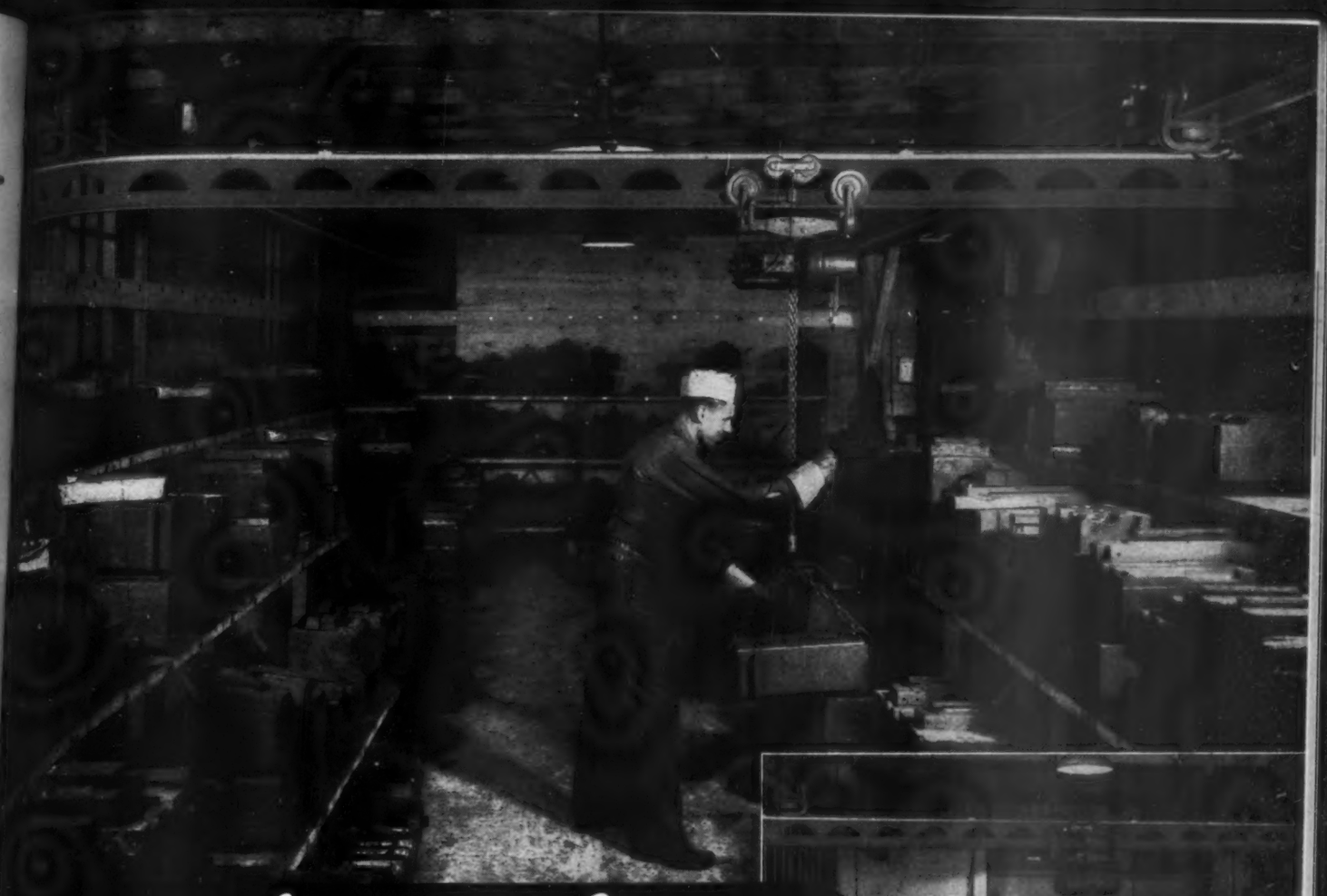
It is claimed that quenching crane solves the problem of moving annealing pots from furnace to quench in the quickest possible time. Serves a compact area containing four or more furnaces set by pairs at right angles facing the quenching machine. One man operates the crane by hand with a ½-ton electric hoist to raise or lower 900-lb. counterweight which picks up or drops the 400-lb. pots. The 7-ft. arm for reaching into furnace is mounted by porter bar on swiveling truck with hoist at opposite end. The American Monorail Co., 13107 Athens Ave., Cleveland.

Air-Flow Director

For use in duct systems to eliminate necessity for long radius turns, allowing the use of right-angle elbows throughout, Uni-Flo Elturn is prefabricated of curved turning vanes. Provides uniform air flow around and beyond turn to reduce resistance caused by eddies, reverse air flow, and



low pressure areas. When used at top of stack heads, provides straight and uniform air delivery to outlet. Sizes up to 48x48 inches are available. Larger sizes prefabricated in two or more sections assembled into single unit by clamps. Barber-Colman Co., Rockford, Ill.



. . . Inexpensive Cranes SAVE VALUABLE TIME!

ELECTRIC CHAIN HOISTS *do the* HEAVY WORK . . .

Easy rolling hand-propelled cranes with electric chain hoists can save time of skilled workers and promote efficiency in dozens of places. Such cranes often pay for themselves within a few months.

The Fairmount Tool & Forging Co., Cleveland, make good use of these cranes. One in the tool and die department cuts lost production time for both skilled workers and machines. This means greater output and lower costs.

Another crane in the die storage department makes possible an efficient die-storage scheme that should prove advantageous to many others. The die storage room has been provided with shelves on which the dies are stored in step fashion in numbered positions. Thus any die can be picked up or set in place without disturbing other dies. Locations of dies are quickly found by means of an index.

Above: Heavy dies are easily handled in this efficient die storage room. The electric chain hoist does the hard lifting. A gentle push moves the crane to any point on the runway.

Below: These valuable men spend less time handling materials and more time with actual production because of the help of this inexpensive Cleveland Tramrail crane.

BOOKLET No. 2008 . . Packed with valuable information. Profusely illustrated. Write for free copy on your company letterhead.

GET THIS BOOK!

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1187 EAST 283RD ST. WICKLIFFE, OHIO.

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CLEVELAND TRAMRAIL

OVERHEAD MATERIALS HANDLING EQUIPMENT

TECO

TIMBER CONSTRUCTION

does another Big Job for **CANADA**

The TECO Ring Connector spreads the load on a timber joint more equally over the cross-section of the wood.

This Boeing Aircraft plant is an example of the part TECO Timber Construction is playing in Canada's defense building program.

The total floor area of the building is 346,000 square feet, all enclosed in wood except the doors. Fifty-six 128' timber trusses carry a roof load of 65 pounds per square foot, plus a five-ton traveling crane, over the main building.

Frame timbers were prefabricated by Canada Creosoting Company, using TECO Timber Connectors in the joints, assembled on the job, quickly raised into position.

Mail Coupon Today!

Timber
ENGINEERING COMPANY
1319-18th Street, N. W., Washington, D. C.
Yeon Building, Portland, Oregon

TIMBER ENGINEERING COMPANY, INC., Dept. 6-O
1319-18th Street, N. W., Washington, D. C.
Please send me without cost or obligation complete information on the TECO Connector System of Construction.
Individual..... Firm.....
Street..... City..... State.....

Case Studies in Building the Will to Win

(*Continued from page 71*)

Car & Foundry, Wilmington, the standard procedure for ship launchings was changed, at the suggestion of the Production Drive Committee, and two children of employees were chosen as sponsors when two new minesweepers hit the water.

So it goes. It is literally impossible to report fully on all the excellent company programs now under way or even to do justice to a single one of them. FACTORY will confine itself, therefore, to random examples of good ideas which may suggest to the reader, in turn, some other good ideas for application in his own plant.

Food for thought is provided by Adolf's evident relish of carelessness. This is another New Departure pay envelope stuffer

First, however, FACTORY again suggests close attention to the technique of installing or intensifying suggestion systems. An unscientifically arranged plan may prove, in the long run, to be worse than no plan at all. The reader's attention is again invited to "Employee Suggestions," Plant Operation Library No. 51, (FACTORY, May, 1942) for a thorough and instructive discussion of the topic.

It is not surprising, in view of the swift spread of the production drive idea, that special services are being

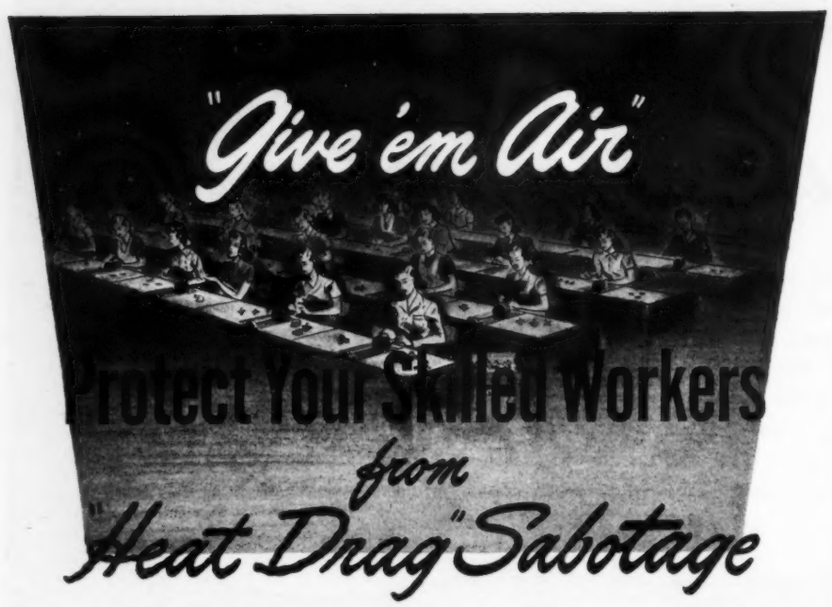
Our First Job

As we see it, our first job is to put all our energy and experience into what we regard as our first essential duty — that of aiding to ensure a free world for free men. Rubber is engaged in that job. It has become a prime necessity of war. Many of the civilian products formerly used in peacetime must now be curtailed or withdrawn entirely for the duration. In reality, what appear to be inconveniences are in fact safeguards. They mean that rubber is fighting for you in the most effective way in order that all its peacetime uses may be resumed as promptly as possible.

BOSTON WOVEN HOSE AND RUBBER COMPANY

TRADE MARK

WORKS: CAMBRIDGE, MASS., U.S.A. — P.O. BOX 1071, BOSTON, MASS., U.S.A.



Employees Get More Work Done with Fewer Mistakes when you "Give 'em Air" with Swartwout Ventilation ★

Heat takes the "starch" out of workers—slows their minds, their hands—smothers their skill. Drive excess heat out of your buildings with Swartwout Airjectors, installed according to Swartwout *Controlled* Air Circulation standards. . . . The Airjector is a scientifically designed *power* roof ventilator with *rotary head*—utilizes outside air currents to increase air flow and save power. . . . Easily installed according to *need.* Serves equally well as a gravity ventilator on cooler days or at night, with fan turned off. . . . You're rewarded with more production, better worker morale when you "give 'em air".

Write for Swartwout 1942 Catalog.

SWARTWOUT-DEXTER HEAT VALVE
•
SWARTWOUT Rotary Ball Bearing Ventilator
•
SWARTWOUT MULTIPLE HEAT VALVE
•

The Swartwout Co.
10509 Euclid Ave. Cleveland, Ohio

Your architect or superintendent of buildings finds a wealth of useful information in the complete Swartwout Catalog File, including guide for estimating roof ventilation requirements.

Swartwout
VENTILATION SPECIALISTS
Also Swartwout Power Plant Equipment

made available to industry by private organizations. Printers, publishers of posters, and advertising agencies are setting up facilities to supply industrial subscribers with all or part of the material needed for a complete campaign. A notable example is that of the James Thomas Chirurg Company, Boston advertising agency.

Belknap & Thompson Inc., of Chicago, who specialize in incentive plans, have also worked out a production campaign service which can be adapted to the needs of individual plants and edited to conform with WPB plans. A number of the industrial concerns which have created their own promotional material are now making it available to other companies engaged in war work.

An interesting byproduct of the national concern over morale is a small booklet, "What is Your War Effort?" containing a "Victory Quiz" taken from a talk delivered by Major Charles S. Stevenson at an employees' banquet of Hall Brothers, Inc., of Kansas City. Five questions each, under the headings, "Financial," "Conversational," "Physical," and "For a Service Man," enable the reader to check with a "V" the points on which he measures up to the ideal of a good, patriotic citizen.

Putting the "Let's Show Them!" spirit into Westinghouse East Pittsburgh rally, Lt. Comm. F. C. Grismer tells workers the Navy needs their best effort

Typical questions "Have you invested in America by buying War Bonds and Stamps to the limit of your ability?" "Do you talk, upon occasion, confidence in ultimate victory, as well as hopefully wishing for it?" "Are you participating in any of the many Red Cross services?" and "Do you write cheerful, newsy letters to your friends in the service to let them

EVER LIGHT A TURRET LATHE WITH MATCHES?

That's what Walter Rabel had to do before they put in G-E Fluorescent Lighting!

WALTER RABEL turns gear blanks on a turret lathe in one of the nation's vitally important subcontract shops. Where he works they make many types of gears—the largest for a big Diesel engine is 19 inches across; the smallest is for an airplane windshield wiper.

BEFORE G-E FLUORESCENT LIGHTING was installed he had to light matches—even in the daytime—to see into the bore to make sure that the cutting tool was properly adjusted. Now with fluorescent lighting, the light is so well distributed that he can see the operation much more easily and quickly.

BECAUSE GEAR MAKING is a precise job done to tolerances as close as one ten-thousandth of an inch, the slightest flaw or imperfection in the feeth of a gear means a reject. With the former lighting considerable time was lost taking the micrometer to the window for reading. Now this is unnecessary.

IF YOUR SHOP NEEDS better lighting for war work and you have a suitable WPB priority rating, ask your G-E lamp supplier about installing fluorescent lighting in certified fixtures with G-E MAZDA F (fluorescent) lamps . . the kind that are *made to stay brighter longer* and that provide cool, efficient "indoor daylight" 24 hours a day.

IF YOU CAN'T INSTALL better lighting now, you can make your present lighting do a better job by doing such things as:

1 Use soap and water . . . on a *regular* cleaning schedule.

2 Right size bulbs in present fixtures.

3 Relocation of present lighting to fit new demands.

4 Supplementary lighting for the most critical seeing operations, such as inspections.

5 Light-colored walls to reduce light absorption; light-colored finishes on machinery to increase visibility.

6 Frequent light meter checks on maintenance.

For further details, see your G-E lamp supplier.

G-E MAZDA LAMPS

GENERAL ELECTRIC

AN ARMY TRAVELS ON ITS

Supply Lines

. . . SO DOES PRODUCTION

● If a modern army is to attain any measure of success, it must have complete and fast-moving lines of supply backing it to the limit. Likewise, high speed machines, turning out shells and guns, planes and tanks, must have supply lines to keep them producing. In America's great plants today where war materials are made, Mathews Conveyers are keeping parts and assemblies flowing to and from machines with speed and control. It's a Mathews job to keep vital material moving.

If you are manufacturing war material, or anything vital to the success of the war effort, you can get Mathews Conveyers to handle that material. Rely as usual on your Mathews Engineer.

MATHEWS CONVEYER CO.

ELLWOOD CITY, PA.

MATHEWS CONVEYERS FOR MECHANIZED PRODUCTION

know that they're remembered by the folks back home and that they're still part of the crowd?"

Now to return to our report on ideas culled from the reports on the many production drive programs that have come to FACTORY's attention:

At the Crosley Corporation, Cincinnati, a dual chart records in graphic fashion the progress of an anti-waste campaign. One side of the chart, labeled "ordnance scrap," is covered with pictures of tanks; the other, labeled "air corps scrap," shows pictures of planes. At the bottom of each side is a black pile representing waste. The higher the scrap pile, the fewer the tanks and planes visible above.

Here's one of several sprightly stickers, for bench or machine or desk, used in Bausch & Lomb "MacArthur Month" campaign

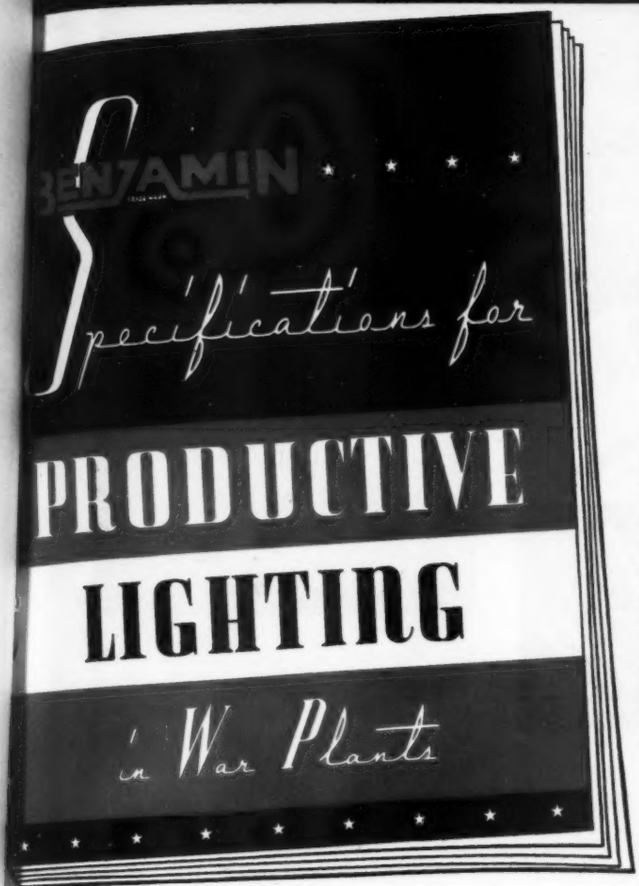
Newspaper advertising plays an important part in the comprehensive campaign of Independent Pneumatic Tool. This drive, incidentally, produced 100 suggestions in ten days against a total of only seven for the previous two years. In its local newspaper campaign the company uses headings such as these: "O.K., Donald Nelson, We'll Produce the Plus" and "Two on the Job to Win the War" (showing father, a company employee, at work, and son in service uniform). A local radio program emphasizes the same themes while posters in the plant declare: "It's not only a tool you're building—it's a tank." Value of advertising, the management believes, lies in the fact that the employee's feeling of importance as a war worker is brought home to his neighbors without his having to say anything to convince them.

At the Corbin Screw Corporation, New Britain, Conn., two large "Bomb

NOW AVAILABLE

The New War Edition Lighting Guide That Shows You

HOW TO USE LIGHTING IN YOUR WAR PRODUCTION DRIVE



Send for This Free Guide to Make Certain You Are Not Overlooking Important Lighting Factors Essential to a Smoother Flow of Increased Output.

Many are the production problems in which lighting is an important factor. For basic to all sustained and efficient production is the worker's ability to see quickly, to see accurately, and to see easily. The worker can do none of these things without good lighting.

Practical Solutions to Production Problems

This new War Edition contains complete data on how to approach, analyze and solve lighting problems. . . . How to analyze the seeing task and determine the lighting requirements. . . . Quick Reference Tables for determining the amount and kind of light required for each of the six major classifications of seeing tasks . . . also valuable data on Lighting as it relates to the problems of increased production, employee fatigue, accident reduction, greater utilization of floor space, 24 hour operation, increased prevalence of employees with deficient vision and controlled conditions plants.

Actual Usable Solutions of 21 Lighting Problems

From the many specific lighting problems submitted for solution to the Benjamin Engineering Staff, there have been selected for publication in this new book, the twenty-one problems most frequently encountered by INDUSTRY CONVERTING TO WAR PRODUCTION. The practical solutions of these problems are illustrated by means of diagrams and layouts. It is the purpose of these problem solutions to provide you with practical solutions of similar problems and to serve as guide in planning new lighting installations and relighting projects.

Authoritative . . . Factual . . . Written in Non-technical Language

This guide has been prepared to meet the pressing need for a reference book by the busy executive, plant man, and architect and all others interested in the use of lighting as a production tool. In its preparation, full use has been made of the successful experiences of the many plants using Benjamin lighting equipment as well as data from reports and publications of the Illuminating Engineering Society, RLM Standards Institute, The National Safety Council and the new "American Recommended Practice of Industrial Lighting" approved by the American Standards Association.

This Manual Brings You Up-to-Date Data on Use of Lighting as a Production Tool!

Contains pages on how to approach the lighting problem, how to analyze the seeing task, how to analyze the factors involved in proper equipment selection . . . also how to determine the proper amount of footcandles with special up-to-minute footcandle recommendation tables as guides.

Here are a few of the twenty-one problem solutions given in this Manual

- How to Provide Efficient High Level Fluorescent Lighting for Large Areas.
- Fluorescent Lighting for Areas Requiring Moderately High Intensities.
- Glassteel Diffuser General Lighting of Soft, Well Diffused, Glareless Quality.
- General Overhead Lighting for High Bay Erecting Shops, Steel Mills, Foundries.
- High Level Local Lighting over Extended Areas of Inspection or Assembly Benches.
- Local Lighting of Spray Booths.
- Protecting Material in Open Vats from Contamination in Case of Broken Lamps.
- Safe Lighting in Atmospheres Containing Highly Flammable and Explosive Vapors.
- Lighting in Locations with Deteriorating Effects of Steam Vapors and Moisture.

BENJAMIN TRADE MARK

WORLD LEADER IN INDUSTRIAL LIGHTING EQUIPMENT

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

Limited Edition! Mail this Coupon for your FREE Copy Today

BENJAMIN ELECTRIC MFG. CO., DEPT. N, DES PLAINES, ILLINOIS

Please rush to me a complimentary copy of your new Book "Specifications for Productive Lighting in War Plants."

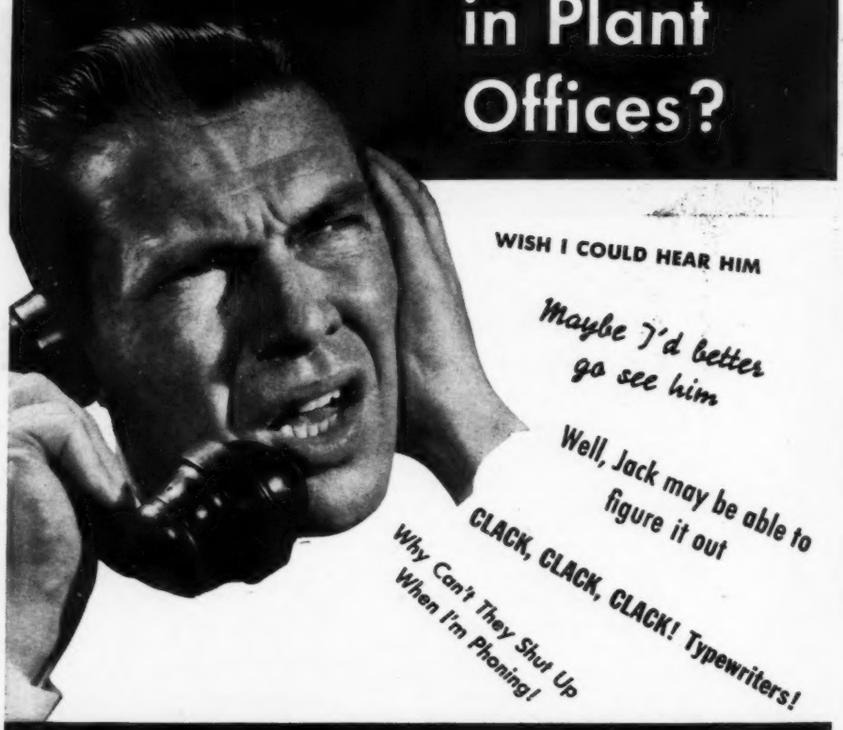
Name.....

Company.....

Address.....

City..... State.....

Unnecessary NOISE in Plant Offices?


WISH I COULD HEAR HIM
Maybe I'd better go see him
Well, Jack may be able to figure it out
CLACK, CLACK, CLACK! Typewriters!
Why Can't They Shut Up When I'm Phoning!

Stop it with a J-M Acoustical Material!!

TODAY MORE THAN EVER, workers in plant offices need all the quiet that can be given them. For uncontrolled noise grates on nerves . . . slows up work . . . causes errors that no plant can afford in these times.

This costly, unnecessary evil can be eliminated, easily and at low cost, by the application of Johns-Manville Acoustical Materials. These fireproof, durable sound-absorbing materials hush noise to an undisturbing level, resulting in increased efficiency, fewer errors and improved morale.

For complete details, write for the J-M Sound Control Catalog, AC-26A. Johns-Manville, 22 East 40th St., New York, N. Y.

JM JOHNS-MANVILLE

SOUND-CONTROL MATERIALS AND ACOUSTICAL-ENGINEERING SERVICE

Tokyo" targets stand at the entrance to record attendance standings of all departments. The name of each department is inscribed on a "spotter" to indicate the percentage of attendance for the previous week. If a department hits the bull's eye with a perfect record, it is listed on an honor roll beside the targets. In the first week of the contest, attendance improved 10 percent, and by the end of the second week the majority of departments were on the honor roll.

On signing pledge, Packard men get "Work to Win" pin. One-wing pin is mark of merit. Coveted two-wing pin is reward of outstanding individual performance

One of the most striking reports of results from a war drive was the announcement of a 25 percent increase in production of the Instrument Division of Thomas A. Edison, Inc., between April 4 and May 7, after plant production scoreboards were set up and an employee organ, "The Instrument Panel," was introduced.

Many observers declare that not nearly enough attention is being paid to office worker morale in industrial plants. They point out that production throughout an organization can be slowed down materially if the office force gets behind on necessary paper work. One company which has consistently recognized this fact is RCA Manufacturing. In its billing department a "production scoreboard" has been set up, depicting Hitler in a large glass jar whose sides are graded with the department's production objective. The nozzle of a water pump hangs

menacingly over Hitler, and the slogan is "Let's Drown the ——!"

A cartoon contest, conducted at the Louisville plant of E. I. duPont de Nemours & Company, was won by a worker who drew a picture of an arrogant, sneering Nazi with the legend, "How'd you like to have *him* for a supervisor?"

At the Weston Electrical Instrument Corporation, Elizabeth, N. J., the War Production Board Committee held a slogan contest which was won by the worker who submitted "We'll Win Working!" Prize presentations were made at a banquet attended by Army and Navy officers and other notables.

Here are some additional examples, from other companies, of worker-contributed slogans: "The War Won't Wait for the Weapon That's Late," "He Who Relaxes is Helping the Axis," and "You Can't Beat Hitler in Here" (for use in washrooms).

This cardboard cutout, 15 inches high, dangles in New Departure plant, reminds employees of the "hanging" ceremony

A valuable, though unsung, adjunct of nearly all good production campaigns, is the employee magazine. Its pages tie together all the features of a program as no other medium can. It enters the home where, in many instances, it receives more of the employee's undivided attention than posters, placards, slogans, or songs. House magazines also play an especially important role as vehicles of news about employees in the armed services and thus help to bring the war closer to employees in the plant. Under "Bugle

WAR IS TEACHING US *this lesson!*

NOW, when speed and efficiency mean so much, we all recognize eye-fag as a sly enemy—a saboteur that wastes our time, effort, and materials. We're learning how better illumination can be put to work to speed hands and increase accuracy—to boost production! The "good lighting" of a few years ago is no longer considered good illumination.

A typical new fixture aiding war production is the Goodrich Highlite, shown at right. Where skilled workers need high intensities with protection from glare, this deep-skirted reflector hides the light source from the field of vision. The heavy glass cover makes cleaning or maintenance a quick and easy operation.

It is but one of hundreds of sizes and styles of Goodrich porcelain enameled fixtures which meet every industrial lighting need. Literature on request.

Protecting vital plants with flood-lighting—saving man-hours in production — Goodrich Industrial Fixtures are serving America's war effort everywhere.

Goodrich Highlite Reflector

RLM

SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4604 BELLE PLAINE AVENUE, CHICAGO, ILL.

IT'S EASY TO REGRIND THESE LUNKENHEIMER VALVES

with a few minutes effort they can be made as good as new

Valve regrinding is really a simple operation . . . it can be done so easily and quickly without taking the valve from the line.

And in this critical period when savings in maintenance time mean so much toward total production . . . even the time saved in the regrinding operation over valve replacement is of vital importance. All parts of Lunkenheimer Regrinding Valves are renewable. A few parts available for an emergency can also save much valuable time.

Fig. 407—Globe

Fig. 414—Lift Check

Fig. 554—Swing Check

Since virtually all materials used in the manufacture of valves are on the list of critical materials, valve users are urged to furnish the highest possible preference ratings on their orders. This will be of mutual helpfulness.

ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI, OHIO, U. S. A.
NEW YORK CHICAGO
BOSTON PHILADELPHIA
EXPORT DEPT. 318-322 HUDSON ST., NEW YORK

LUNKENHEIMER VALVES

Calls," for example, the Western Electric Distributor lists all new enrollees in the service, while a front-page box keeps regular tabs on the total of employees who are engaged in all branches of serivce.

Poster is department prize for perfect attendance during week at Corbin Screw Corporation of New Britain, Conn. Award, keyed to plant-wide "Bomb Tokyo" attendance campaign, brought 10 percent improvement in one week, got even better results later

To date, all the articles in this series have dwelt on methods of building morale. What are some of the factors that cause morale to deteriorate? The Labor Relations Institute of New York has issued a manual entitled "Boost Production through Increased Employee Morale," which not only contains many valuable pointers on positive factors but lists, as well, fifteen of the "little things" which, the Institute believes, may break down morale in war plants.

Under the heading of "morale killers" this publication places (1) inadequate grievance machinery, (2) lack of recreational facilities, (3) improper lighting and ventilation, (4) inexperienced and inadequately trained foremen and supervisors, (5) haphazard policing of safety rules and devices, (6) favoritism, (7) failure to keep employees in touch with company policies, (8) indefinite shoprules, (9) lack of efficient suggestion systems, (10) neglect by management to compliment employees on good work, (11) lack of rest periods, (12) ill-kept washrooms, (13) inadequate lunch facilities, (14) crowded locker space, (15) unclean floors, windows, and machines.

IT PAYS TO SPECIFY WESTINGHOUSE UNIT DRIVES FOR AIR CONDITIONING

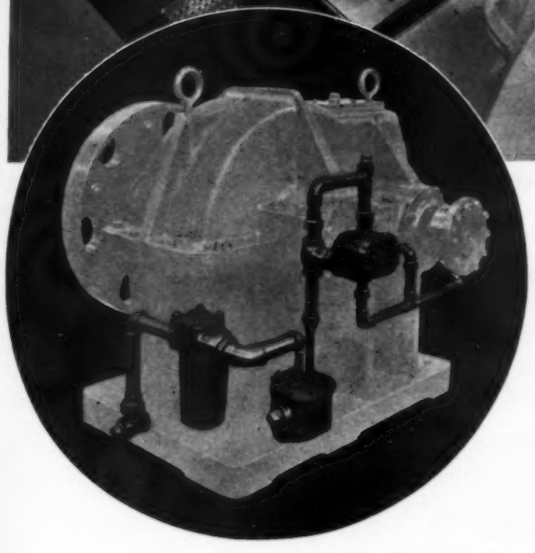
MORE EFFICIENT

air conditioning

...because

GEARING

is matched to the job!



EXTERNAL FORCED-FEED LUBRICATION

Entire system is external, permitting easy maintenance. The oil is continuously strained and cooled. The oil pump is always primed, ready for instant duty. These are additional quality features of Westinghouse air conditioning gear units.

Gearing is the heart of a successful air conditioning installation. It must match the characteristics both of the motor and the compressor—and at the same time solve the problems of vibration, gear life, noise and lubrication that occur when shaft speeds are stepped up to 6000 rpm and more.

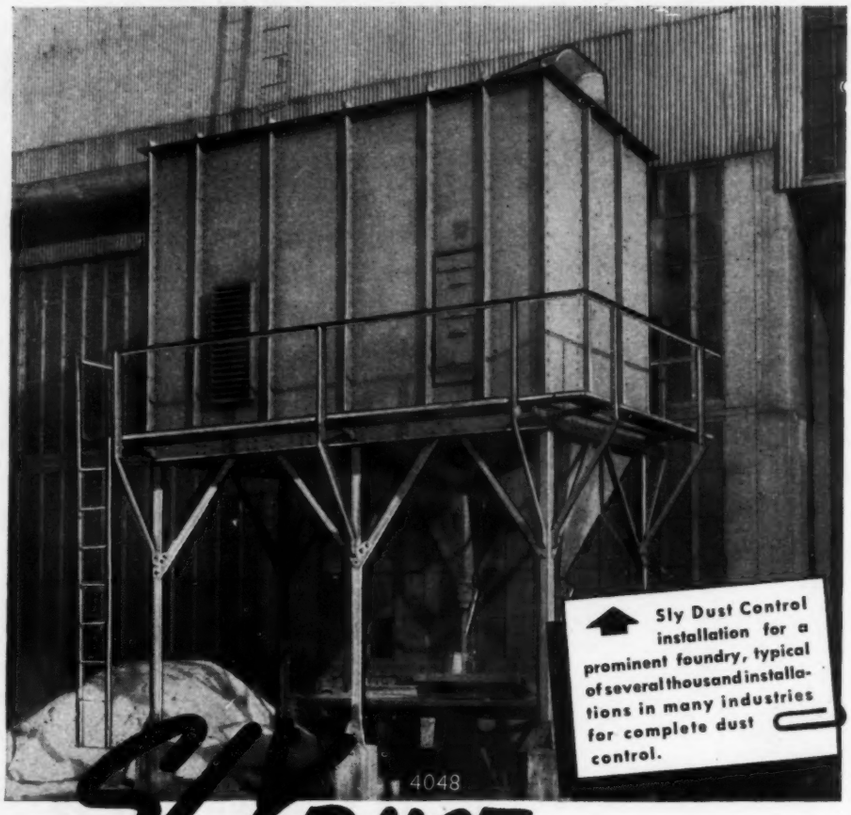
Westinghouse Speed Increasers help to account for the success of outstanding air conditioning installations because Westinghouse gears are designed to fit the job. Teeth are precision cut by the hobbing process on specially designed machines. Unit stresses are low. Skilled workmen make Westinghouse gears practically wearproof, insuring long life, quiet operation.

Westinghouse Speed Increasers are one of the reasons it pays to specify complete Westinghouse Unit Drives for air conditioning installations. Investigate—write for Bulletin 3044. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-07198

Westinghouse GEARED DRIVES

This advertisement appears in FACTORY MANAGEMENT & MAINTENANCE and HEATING & VENTILATING for June, 1942


Sly Dust Control installation for a prominent foundry, typical of several thousand installations in many industries for complete dust control.
4048

SLY DUST CONTROL

Is Helping Industry Get Top Production

★ *War production demands clean plants. Good working conditions for employees is one of the most important considerations today in meeting the demands for production and more production.*

SLY Dust Control is inexpensive insurance against health hazards—against lost time. It enables men to work to better advantage—to accomplish more. Thousands of users find in Sly Dust Filters certain exclusive advantages:

(1) Greater filtering capacity because of more filter cloth.

(2) Less maintenance due to simpler shaker mechanism.

(3) Bag replacement easily handled.

(4) Complete dust removal with minimum resistance to air flow because of filter bags under tension.

(5) Automatic control (any degree).

These features help enormously in efficient operation.

Write us fully. We will analyze your situation and tell you exactly what can be accomplished. Sly Dust Control pays for itself.

THE W. W. SLY MANUFACTURING CO.

Branch Offices in Principal Cities

4755 TRAIN AVENUE CLEVELAND, OHIO

SLY INDUSTRIAL DUST CONTROL

Do's and Don't's for New Executives

(*Continued from page 72*)

flection of what you present to it. Use your face so that it will be an asset. I knew a great salesman who had a large mirror in his home before which he used to stand and try to sell himself as if he were selling to a customer. In the practice of this exercise, he would ask himself repeatedly, "Would I buy anything from a guy who looked like that?" I have known men with the kindliest spirits who became almost lonely because they developed a set, "dead-pan," or sour expression which did not invite warmth from others. I have known men who, by being grinning smilers, turned others away doubting their sincerity. Learn to control your face so that it will be an invitation to confidence.

After these personal characteristics, we move to thoughts of business conduct. Maybe in your former sphere you were, and well could be, "buddy" and "palsy-walsy." Now, generally speaking, those days are over. There is a penalty for living in the high places, and that penalty is loneliness. When one reaches the highest positions, one is unfortunately almost always completely alone as far as friendly intimacies are concerned. The junior executive is beginning to tread that path.

The Middle Path

I do not imply that one must lose his friends, or cut them, or like them less. A certain reserve is to be cultivated, and each person must judge for himself and suit it to his own being. He must be reserved enough to ward off the suspicion of playing the "friendship game," but not reserved enough to get himself labeled "high-hat," "stiff-necked," or "stuck-up." The gradations are delicate—the method cannot be defined—it is an individual personality adjustment. The thought here is given so that each man may consciously choose for himself his course and manner.

Particularly avoid trying to be over friendly to those above—that is, giving the appearance of "apple polishing"—and certainly avoid being "high hat" to those below. On the other hand, avoid being timid, shrinking, and affectedly modest with men of high rank either in your own firm or in others. In other words, meet the world squarely, naturally, and be conscious of your own worth.

In the matter of expressing your

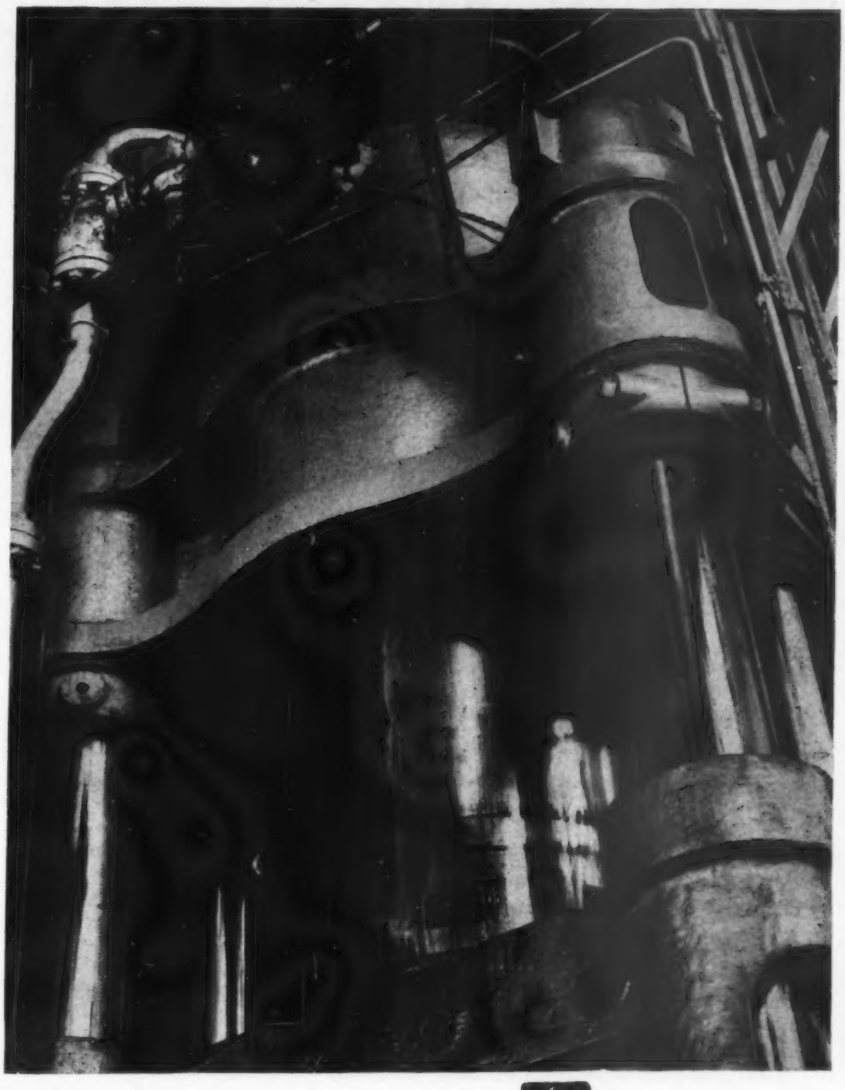
WORLD'S LARGEST Boiler Plate-Bending Press

A SPECTACULAR example of recent progress in boiler manufacture, this *world's largest boiler plate-bending press* is capable of cold bending boiler plate up to 7 inches thick and in lengths up to 40 feet. It permits the forming of heavy boiler drums by the most desirable method and in the shortest possible time. The ability to cold form in the final stages of bending assures the greatest accuracy of circularity and helps to reveal flaws which might readily escape detection with the hot-bending method.

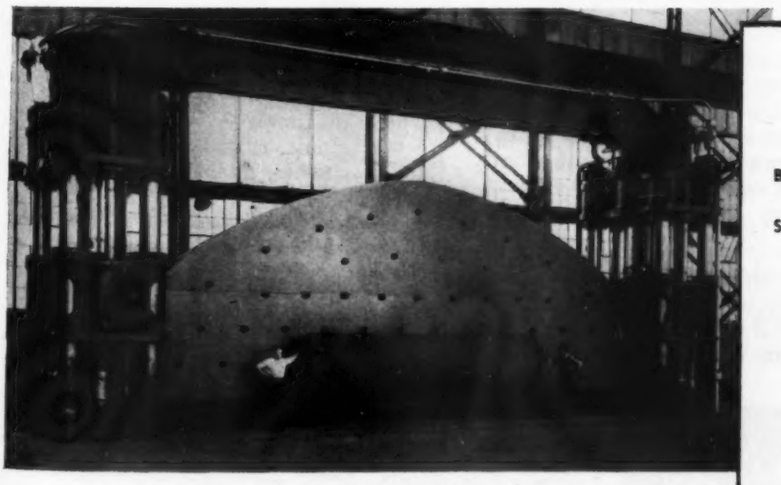
Operated at its maximum capacity, this press exerts a pressure of 6000 tons. Its overall height is 55 feet; its beams, with attachments, weigh nearly 1,000,000 lbs.; over 1000 tons of poured concrete were required for its massive foundation. With other presses of smaller capacity and heavy rolling equipment, it gives C-E unexcelled facilities for the manufacture of boiler drums.

What significance has this big press for the man who influences the selection of boiler plant equipment? Simply this – it evidences a manufacturing policy which in hundreds of less dramatic ways provides the purchaser with the latest achievements in design and construction when he entrusts his steam generating problems to C-E.

A-637



At Right—One of two 3000-ton four-post hydraulic press units showing one of the main rams which are 50" in diameter.



Complete view of the world's largest boiler plate-bending press which exerts a total pressure of 6000 tons.

C-E

Most Extensive Line of Steam Generating and Related Equipment Offered by Any Manufacturer

BOILERS • STOKERS • PULVERIZED FUEL SYSTEMS
FURNACES • STEAM GENERATING UNITS
SUPERHEATERS • AIR HEATERS • ECONOMIZERS
CHEMICAL RECOVERY UNITS
DRYING AND INCINERATION SYSTEMS

COMBUSTION ENGINEERING

COMPANY, INC.

200 MADISON AVENUE, NEW YORK, N. Y.

METHODS for BURRING POLISHING BUFFING FINISHING

Here's an exceptionally useful service to all MANUFACTURERS with such problems

FOR years, Lea Engineers have served industry in its many-sided peaceful pursuits by pointing the way to more economical polishing, buffing or finishing, or to better results. Lea Engineers are the authorities on this subject.

Today, the manufacture of articles of commerce has been laid aside—today it's weapons and equipment for the grim task of staying on top. To polishing, buffing and finishing problems has been added BURRING. This is causing the greatest concern. In countless plants, valuable time is being lost, rejections too high, and tolerances too ragged because of the use of hard wheels, hand filing, emery cloth, etc.

Send for this Bulletin on the Lea Method of Burring

Lea Engineers have found the solution to many BURRING problems. In an ever-increasing number of plants making engines and engine parts, machine guns, and other equipment, the Lea Method of Burring has been adopted. Time is saved, closer tolerances permitted, rejections lowered.

If you have a problem of Burring . . . or Polishing, Buffing or Finishing . . . write us in detail. We'll be glad to send literature and have our representative call.

THE LEA MANUFACTURING CO.

WATERBURY, CONN.

Specialists in the Production of Clean-Working Buffing and Polishing Compounds

6-LM-7

opinions, always remember that a good firm and a smart superior officer or employer are buying your opinions—not your agreement. Be firm in giving your opinion when it is wanted, but try to do it without being opinionated or obstinate where your opinion appears to differ from that of your associates.

If you sacrifice giving your opinion in favor of giving your agreement, then you are a "yes-man," and you are not giving your employer what he hoped to be buying.

Do not be afraid of taking responsibility. But in taking it be sure that it is clearly defined, and that you understand both its extent and its limitations.

Above all, be cheerfully cooperative even though the course of action is one upon which you do not fully agree. Once it is chosen, give your fullest support. The halfback who, because he does not agree with the called signal, goes off on an individually chosen course is never chosen for "All American."

At this point, I might emphasize another little football simile that has often come to me. Cooperate. Play the game your team is playing as long as you are on it, even though at times you disagree with the details. I have never heard of a player winning a game which his team lost, nor do I know of many teams winning without the full cooperation of every player.

Never hesitate to give credit to others, especially your subordinates. It will build morale. The "credit grabber" never gets far.

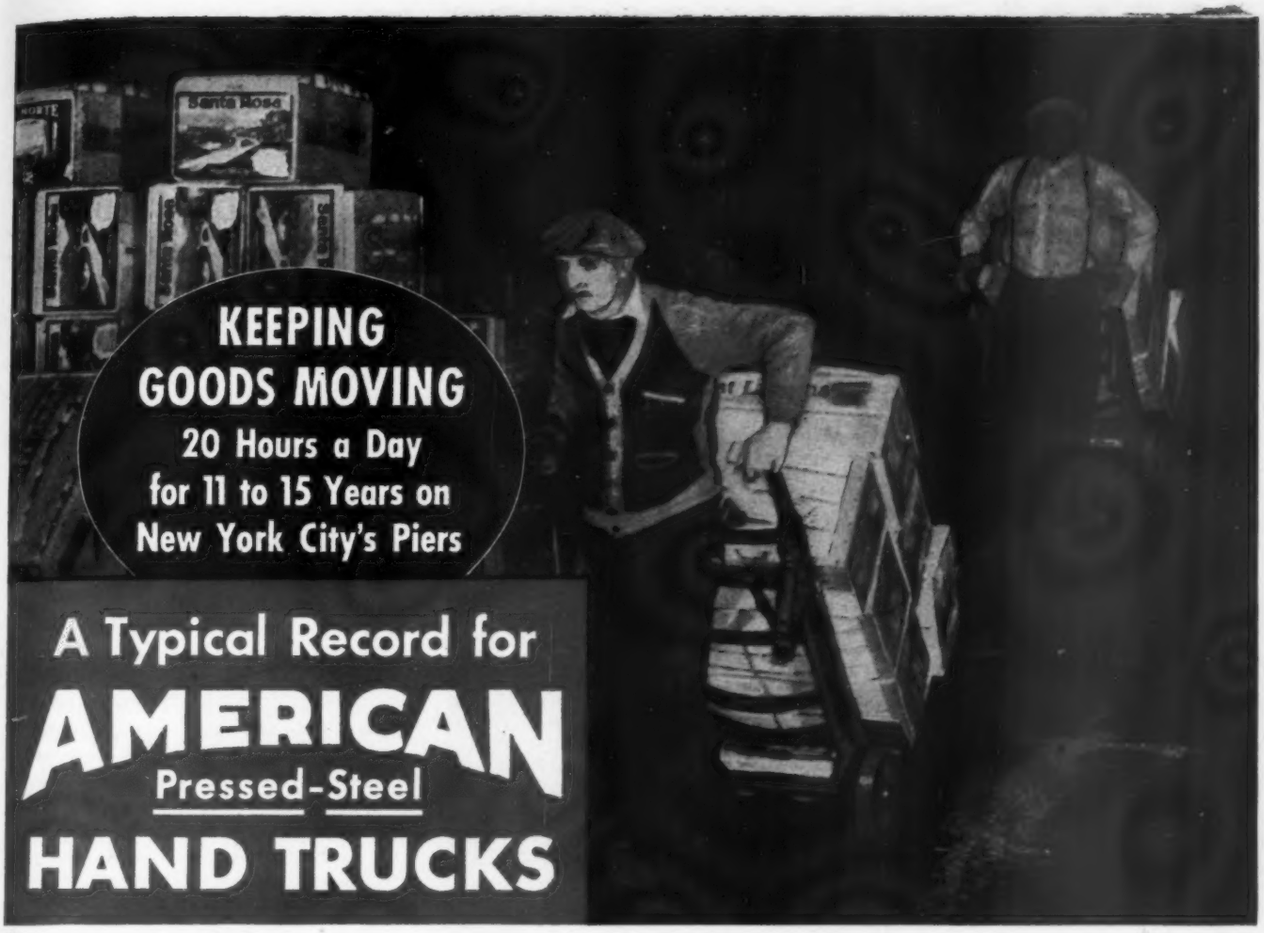
Outside Contacts

There is also the matter of contacts outside of the firm or business. It is well, I believe, to belong to at least one organization of the type of activity in which you are working. I refer to such things as advertising clubs, engineering societies, salesmen's and sales managers' clubs, foremen's clubs. There you will meet, observe, and learn from men who are striving in the same activity as yourself. In such activities, take an active part so that you may get the most benefit. On the other hand, avoid being a "joiner." I have known men to get so many outside activities that they had no energy left for their job.

Of course, I need not mention work. We all know that work—just plain hard work—is the foundation of all accomplishment. Genius is 98 percent work.

Conserve yourself. Take time to live. Give much attention to important matters, less to lesser matters. Learn to put first things first.

Keep your desk and your mind



Every day, hundreds of carloads of perishable fruit, dairy products and other goods are brought in from the West to New York City's piers. This valuable merchandise must be moved *fast* to metropolitan markets . . . so more than 1000 *American Pressed-Steel Hand Trucks* are kept busy, 20 to 22 hours daily . . . hauling heavy loads over wood, steel, and concrete surfaces.

These "Americans" have certainly proved their *durability* . . . and have paid their own cost many times over during the long time they have been on the job on these North River piers. And, all through these years repairs have been negligible.

Truckers for one large company, using 400 *American Pressed-Steel Hand Trucks,* report that they prefer "Americans" because they handle loads of 600 to 700 pounds *easily,* with practically *no down time!*

This excellent record is typical of the performance of *American Pressed-Steel Hand Trucks* in every industry. Write us today for Catalog T-41, showing models for every type of service. Let us *prove* that "Americans" can cut your handling costs . . . for the long haul!

AMERICAN Pressed-Steel HAND TRUCKS Offer You "Down-to-Dollars" Advantages

$ Strong, durable, clean . . . no splintering or chipping.
$ Last for many years in the toughest service.
$ Light and easy to handle.
$ Minimum down time or maintenance.
$ Preferred by truckers everywhere.

The American Pulley Company
4240 WISSAHICKON AVE., PHILADELPHIA, PA.

45 Billion
GEAR TOOTH CONTACTS
(500,000 PER MINUTE)
.. without measurable wear
A prominent manufacturer added "dag" colloidal graphite to his grease for a test involving 1500 hours of running time and 500,000 gear tooth contacts per minute. No measurable wear was detected . . . Subsequent performance of the test grease without "Oildag" (colloidal graphite in oil) was unsatisfactory . . . Send for comprehensive report by their test engineer and bulletin No. 220 E
ACHESON COLLOIDS CORPORATION
PORT HURON, MICHIGAN
"Dag" and "Oildag" are registered trade-marks of A. C. C.
dag
COLLOIDAL PRODUCTS
The electric-furnace graphite used in "dag" products is made in U. S. A.

To Industry: "Dag" Colloidal Graphite is a lubricant – resists extreme temperatures and pressures – is electrically conductive, opaque and chemically inert – can be suspended in many liquids including the lighter viscosity fluids.

clear. Neither a cluttered desk nor a cluttered mind is the sign of a good manager. A disorderly desk often shows a disorderly mind.

Keep fit. Watch your physical condition. Get sufficient rest. Have some trusted friend tell you if your breath is bad, and if so, get it cared for at once. It is well to remember, you can't trade in your worn-out body on a new one—and you can't buy spare parts. If in periods of stress you overdraw your account at the bank of energy, be sure that you make deposits to balance your account.

Time—your time and the time of your associates—is a commodity of limited supply. Be prompt in meeting appointments; be sparing in the expenditure of time.

Now the Don't's

I would like to be able to stay entirely on the positive side, but there are a few short "don't's" which I believe can be better expressed in the negative.

Don't feel that you must immediately lose all your former friends and acquaintances. In fact, you will need their support, their good wishes, and their cooperation.

Don't push, or appear to push, in the matter of making friends among the higher-ups, but meet their advances graciously.

Don't try to limit yourself to "working hours." You are leaving that behind you. If you're really going to be successful, you are approaching the time when your working hours will be your thinking hours, and that may get to be almost all your time.

Don't be late for appointments.

Don't overwork. A worn-out, tired, unrested man will not progress.

Don't make a show of working like hell—it won't fool anybody.

Don't take advantage of your newly acquired power or authority to be bossy or snappy. The biggest men are usually the most patient and the kindest.

Don't pass the buck.

Don't maintain too-close friendships and intimacies with other men in the same firm. Also, too-close interfamily associations are frequently handicaps. There are exceptions, but generally speaking it is a sound "don't."

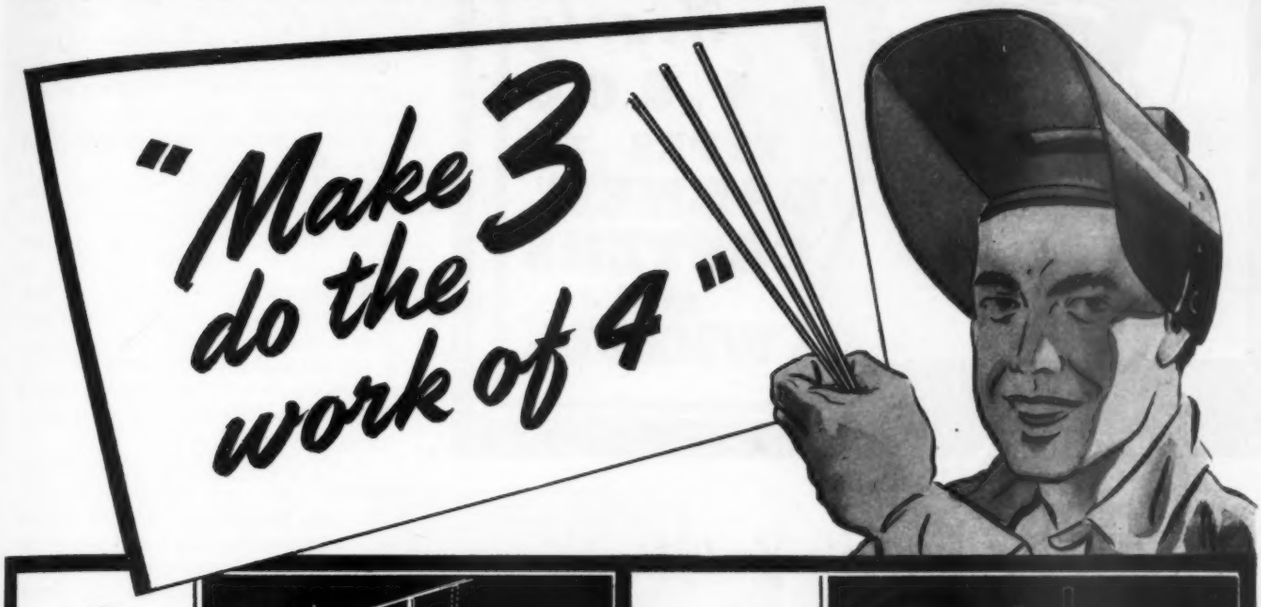
Don't try to hang onto anyone's coat tail.

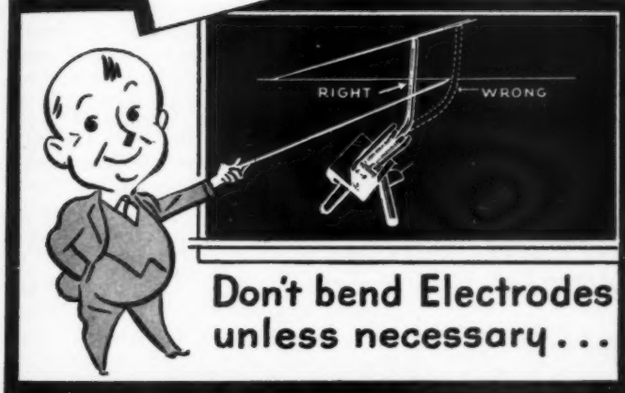
Don't try to pull others along with you, or establish what might be considered by others as favorites. Each must carry his own weight in this race of life.

Don't be afraid to say "I don't know." When you don't know, don't guess.

While on this subject, I might as

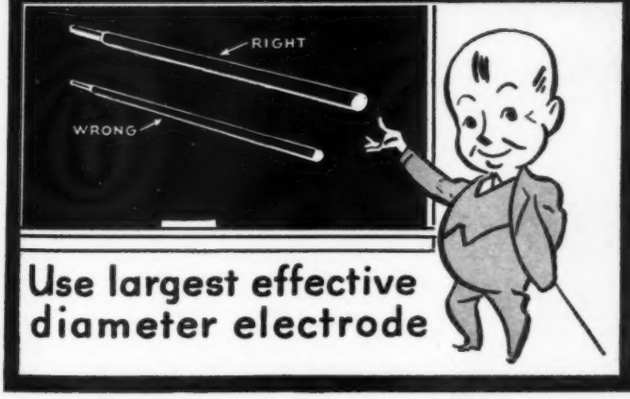
WELDING ELECTRODES ARE SCARCE



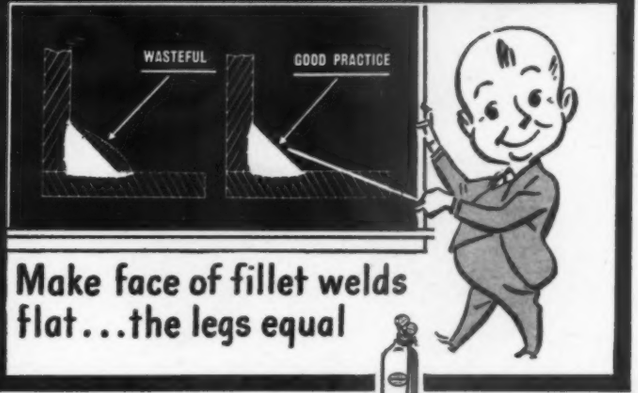


Don't bend Electrodes unless necessary...

Dont leave more than 2" Stub...



Use largest effective diameter electrode



Make face of fillet welds flat...the legs equal

A booklet of shop bulletins illustrating "'do's' and 'don'ts'" has been prepared. We'll gladly send you as many copies as you can use.

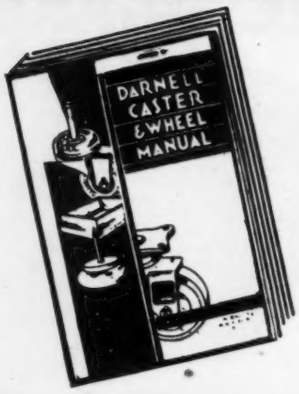
We can all prevent waste of valuable welding electrodes by following these and other simple, common sense suggestions. 25% to 30% more welding can, and must, be obtained from available electrodes.

AIR REDUCTION

60 EAST 42nd STREET, NEW YORK, N.Y.

In Texas: Magnolia-Airco Gas Products Co.

IDLE CYLINDERS ARE PRODUCTION SLACKERS: KEEP 'EM ROLLING FOR VICTORY!



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Whether for light, medium or heavy duty use, Darnell Casters and Wheels are built to take punishment.

Built-in quality assures a long life of efficient service—it pays to "Demand Darnell Dependability".

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CASTERS & WHEELS
FREE Manual FOR THE Asking

DARNELL CORP. LTD., 60 WALKER ST., NEW YORK, N.Y.
LONG BEACH, CALIFORNIA, 36 N. CLINTON, CHICAGO, ILL.

well mention one of the biggest "don't's" of all—don't have improper associations or intimacies with members of the opposite sex in your own company. Don t even appear to have them. This is a sure path to a disagreeable and difficult situation which may easily end your career.

Don't criticize your associates to each other.

Don't, no matter how great the temptation, either from ambition or pique, attempt to knife some of those above you by criticism to others in management. The chances are that they know each other better than they know you and when this practice is indulged in, the likelihood is that the only person being hurt is yourself and your intentions are seen through completely.

Don't gossip and don't ridicule.

Don't let your personal troubles, trials, and tribulations, and bad humor be visible or be taken out on those about you.

Don't talk too much. A closed mouth and an open mind are often assets.

Now, looking back over what I have written, it all points to just one thing. In your new status, study. Study your job, study those about you—but most of all, study yourself. The object of all this study should be the performance of your job in the best way possible and the harmonizing of yourself and your personality with those about you. After all, that is your job—it is not their job. You alone can make your success and now that you are started on the upward path, no one but you, yourself, can stop you.

Significant Labor Developments

(*Continued from page 83*)

than the rise in the cost of living during the past two years.

Under the policy laid down by the Board in the International Harvester case:

1. All workers are to receive wages sufficiently high to enable them to maintain a standard of living compatible with health and decency.

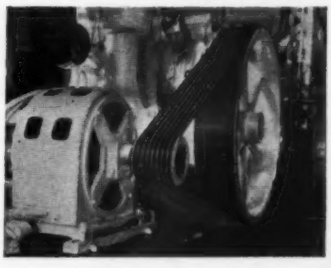
2. Real wage levels which have been previously arrived at through collective bargaining and which do not impede maximum production are to be reasonably protected. (This does not mean that labor can expect wages to keep pace with upward changes in the cost of living, but wages in substandard brackets should, whenever

Because this Thorobred has a Fighting Heart...

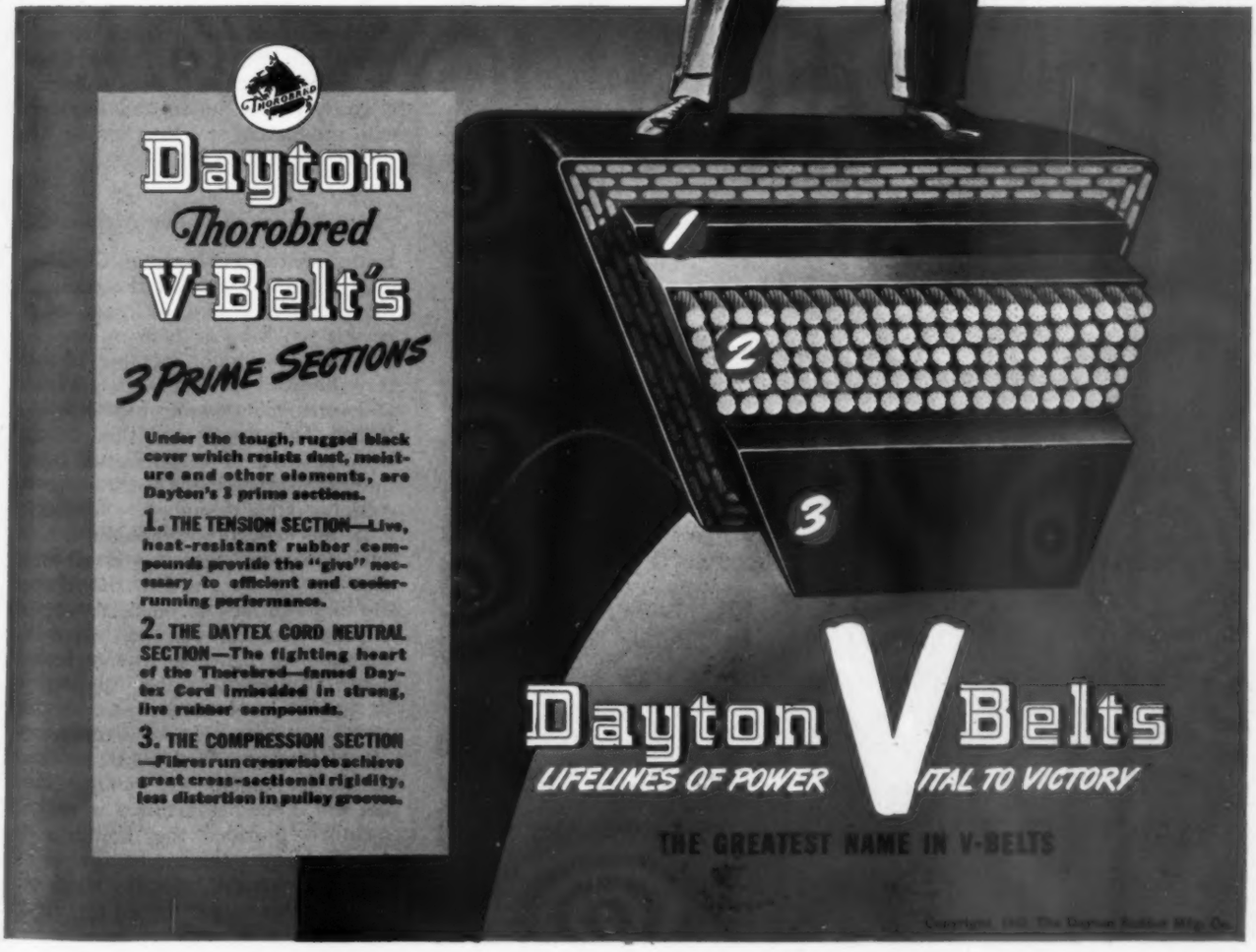
YOU GET AS MUCH AS 41% LONGER LIFE

Beneath the tough, sleek, black coat of the Dayton Thorobred Wrapped-Molded type V-Belt, there is a fighting heart of Daytex Cord—a heart built right into the Thorobred with its three prime sections (a construction principle pioneered and patented by Dayton). The test evidence of the extra long life that the Dayton Thorobred gives you, as contrasted to other leading belts, is shown on the chart reproduced here. But the very best evidence of the Thorobred's performance is the hundreds of field applications in many important industries. These applications prove beyond question that the Thorobred is everything that its name implies.

THE DAYTON RUBBER MFG. CO.
Dayton, Ohio
DAYTON RUBBER EXPORT CORP.
38 Pearl Street, New York, N. Y., U. S. A.
THE WORLD'S LARGEST MANUFACTURER OF V-BELTS



41% LONGER LIFE THAN THE AVERAGE OF 4 LEADING BELTS
DAYTON THOROBRED
BELT "2"
BELT "3"
BELT "4"
BELT "5"
41% longer life than the average of four belts tested—28% longer life than the next belt—that's the result of tests charted here which were operated under identical conditions as to size, load, speeds, tension, pulley diameters and ambient temperatures.


Dayton Thorobred V-Belts
3 PRIME SECTIONS
Under the tough, rugged black cover which resists dust, moisture and other elements, are Dayton's 3 prime sections.
1. THE TENSION SECTION—Live, heat-resistant rubber compounds provide the "give" necessary to efficient and cooler-running performance.
2. THE DAYTEX CORD NEUTRAL SECTION—The fighting heart of the Thorobred—famed Daytex Cord imbedded in strong, live rubber compounds.
3. THE COMPRESSION SECTION—Fibres run crosswise to achieve great cross-sectional rigidity, less distortion in pulley grooves.
1
2
3
Dayton V Belts
LIFELINES OF POWER VITAL TO VICTORY
THE GREATEST NAME IN V-BELTS

Save Valuable Man Hours
BY INSTALLING
INLAND 4-WAY FLOOR PLATE!
It reduces accident liability on floors, platforms, runways, stair treads, etc.
INLAND STEEL CO.
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St. Louis • Kansas City • Cincinnati • New York

possible, be raised to the standard level.)

3. To the extent that it can be done without inflationary effects, labor is to be encouraged to seek, through collective bargaining, reasonable upward wage adjustments to offset increases in the cost of living.

The Board granted a wage increase of 4½ cents an hour, effective Jan. 15, 1942, in place of 12½ cents asked, with the understanding that no further change should be made for six months from that date. Thereafter changes are authorized to be made at three-month intervals.

**Check-Off Allowed*

The War Labor Board allowed a check-off clause in behalf of the United States Electrical Workers (CIO), of the "sum not to exceed $1 a month on the written authorization of union members, such authorizations being revocable on 60 days' written notice." This is a logical extension of its earlier ruling that a prior granting of the check-off to an inside union constituted a forceful precedent for recommending the check-off in favor of an outside union.

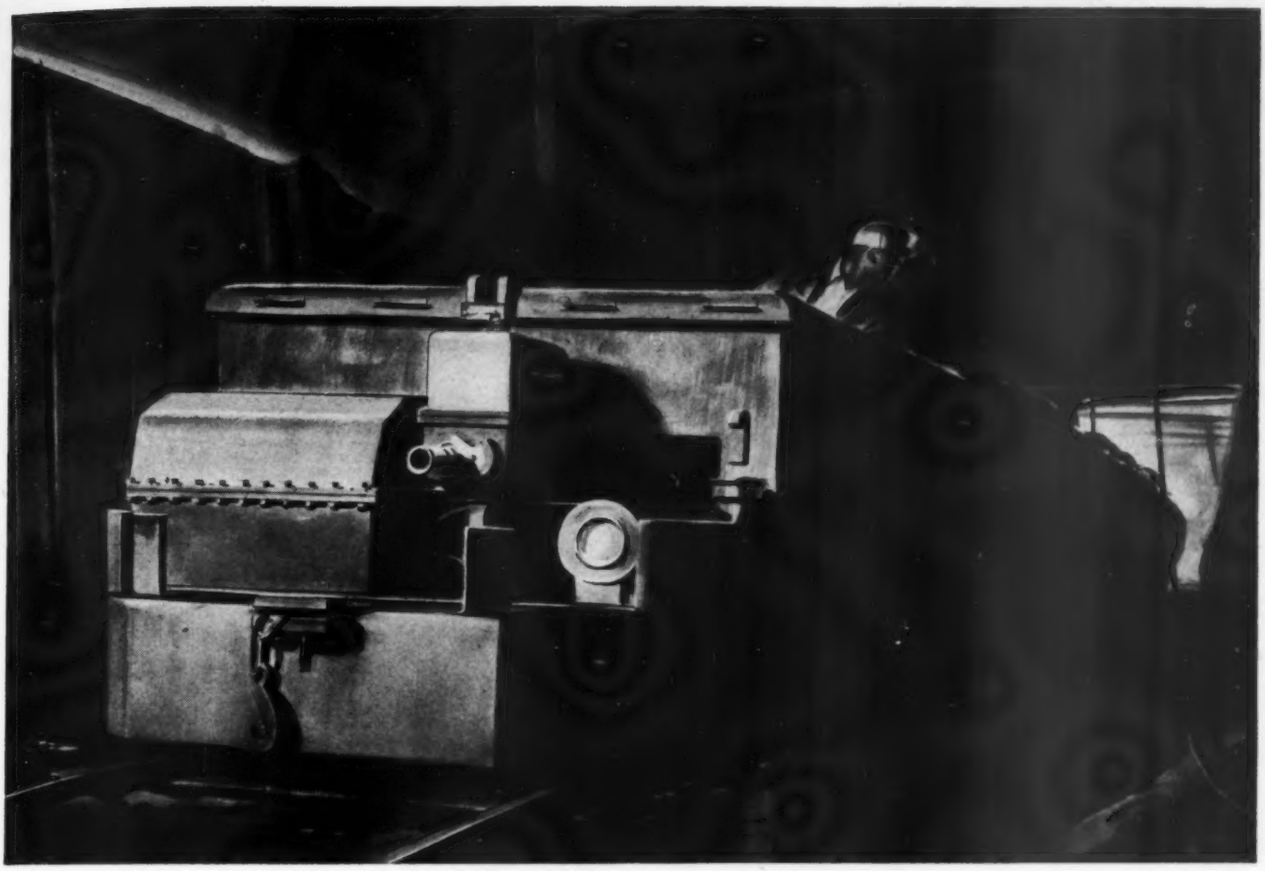
In another decision it directed a check-off upon authorization of individual employees, in a plant where the present method of dues collection is costly to the union and interferes with production. (White Sewing Machine Corporation.)

**Maintenance of Union Membership*

In International Harvester Company case the Board ordered the company to sign a maintenance of union membership provision in its union contract if a majority of union members in each of eight plants favored such provision at a secret referendum ordered by the Board. This decision, favored by the representatives of the public and labor, in effect imposes a closed shop by Administrative ruling.

In the Federal Shipbuilding & Drydock Company case the Board held that unions are entitled, during the life of a contract, to financial support of those who were members when the contract was signed or who thereafter become members. Such support is basically related to the maintenance of the contract and the maintenance of production. The Board will not compel non-members to join the union nor will it compel members to remain members provided they continue to pay their dues, the mechanism to insure such payment being the check-off.

In another case it denied the union shop or maintenance of membership



The "Sandhog Motor" that got a new lease on life

How Electrical Engineers Used Fiberglas* to Combat a Combination of Tough Operating Conditions

* * *

A hard-working mining locomotive carried men and materials for construction work in a Hudson River tunnel. Pulling heavy loads with many quick starts and stops subjected the locomotive motor to overloads as high as 30%! In addition, the motor worked in surroundings of mud, moisture, and sand. The tough combination caused insulation failure on an average of every six months. Three years ago, the engineers of an alert electrical service shop re-insulated the motor, skillfully adapting Fiberglas to the job. The locomotive finished the tunnel work without further breakdown . . . went on to other work . . . and is still operating today *with no insulation failure!*

★ ★ ★

THE "SANDHOG MOTOR" that got a new lease on life is one of many instances where electrical engineers have employed Fiberglas to help meet the damaging combination of heavy overloads and adverse surroundings.

This and similar combinations of severe working conditions are *more urgent problems than ever before.*

For today nearly all electrical operating equipment is contributing to the war effort. It is the vital source of power turning industry's wheels in the war "speed-up." And this power must not fail, even though the demanded output *far exceeds* that for which the equipment was *originally designed.*

So—keeping equipment from failing and slowing up vital war production is one of the major responsibilities of electrical engineers.

And wherever the combination of severe operating conditions and heavy overloads threaten to cause failures and downtime, forward-looking engineers are giving attention to Fiberglas as their electrical insulation. They are finding that Fiberglas, well-applied and combined with the proper impregnants, gives a *higher* margin of safety with fewer breakdowns resulting from insulation failure.

If overloads and other tough working conditions are presenting you with a double-barreled combination of motor problems, remember Fiberglas electrical insulation. Consult your electrical manufacturer or service repair shop. Or write us: *Owens-Corning Fiberglas Corporation, Toledo, Ohio. In Canada, Fiberglas Canada, Ltd., Oshawa, Ontario.*

*T. M. Reg. U. S. Pat. Off.

OWENS-CORNING

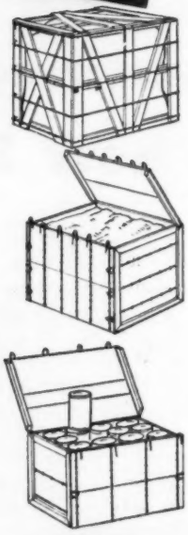
FIBERGLAS

BE READY TO SHIP IT QUICKLY, ECONOMICALLY —"After the Unveiling"

● New products for Victory—and those planned for tomorrow—present new problems in materials, production *and* in packing and shipping procedures. Old methods no longer will serve. Research, helping scores of manufacturers "beat the promise" or prepare for the future, also provides the answer to: How to ship it?

Today General Box technicians are co-operating with producers of many types of products. Out of the General Box laboratories are coming containers which assure faster, safer, more economical transportation of small parts and heavy units—bolts and generators—motors and foods.

You, too, may be able to save precious man-hours—provide protection and easier, faster handling for your present and future products by utilizing the facilities of the General Box laboratories. Whether your products will require boxes, crates or special containers, the new General Box booklet, describing a few of the results of this free laboratory service, will be helpful. Write for your copy today.



GENERAL BOX COMPANY

General Offices: 504 N. Dearborn St., Chicago, Ill. District Offices and Plants: Brooklyn, Cincinnati, Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, New Orleans, Sheboygan, Winchendon. Continental Box Company, Inc.: Houston, Dallas

GENERAL BOX COMPANY
504 N. Dearborn St., Chicago, Ill.
☐ Send a free copy of the booklet illustrating engineered shipping containers.
☐ Have a General Box engineer call.

Name.....

Address.....

City.....*State*.....

where more than 85 percent of the employees are members of the union. (Armstrong Brothers Tool Company.)

Company Ordered to Recognize Union

The Board directed Sperry Gyroscope Company to recognize a union as representative for its members in matters pertaining to grievances even though it was held that there was to be no majority-designated union in the plant.

Compelling Settlement

Two methods of compelling labor and management to settle their disputes have been utilized:

1. MANDATORY CONTRACT. Because of the inability of labor and management to agree, the Board undertook for the first time to formulate a mandatory contract calling for voluntary and revocable dues, assignment and a wage increase of 5 cents an hour, and containing clauses dealing with overtime, seniority, and grievance procedure.

The Board justified this novel technique of writing a contract for the parties on the ground that if the disputants were left to their own devices the case would be interminably prolonged and an agreement would perhaps never be reached.

Management's refusal to subscribe to the contract raises the threat of possible recommendations to the President to order compliance under penalty of having the property taken over by the government for the duration. (Arcade Malleable Iron Corp.)

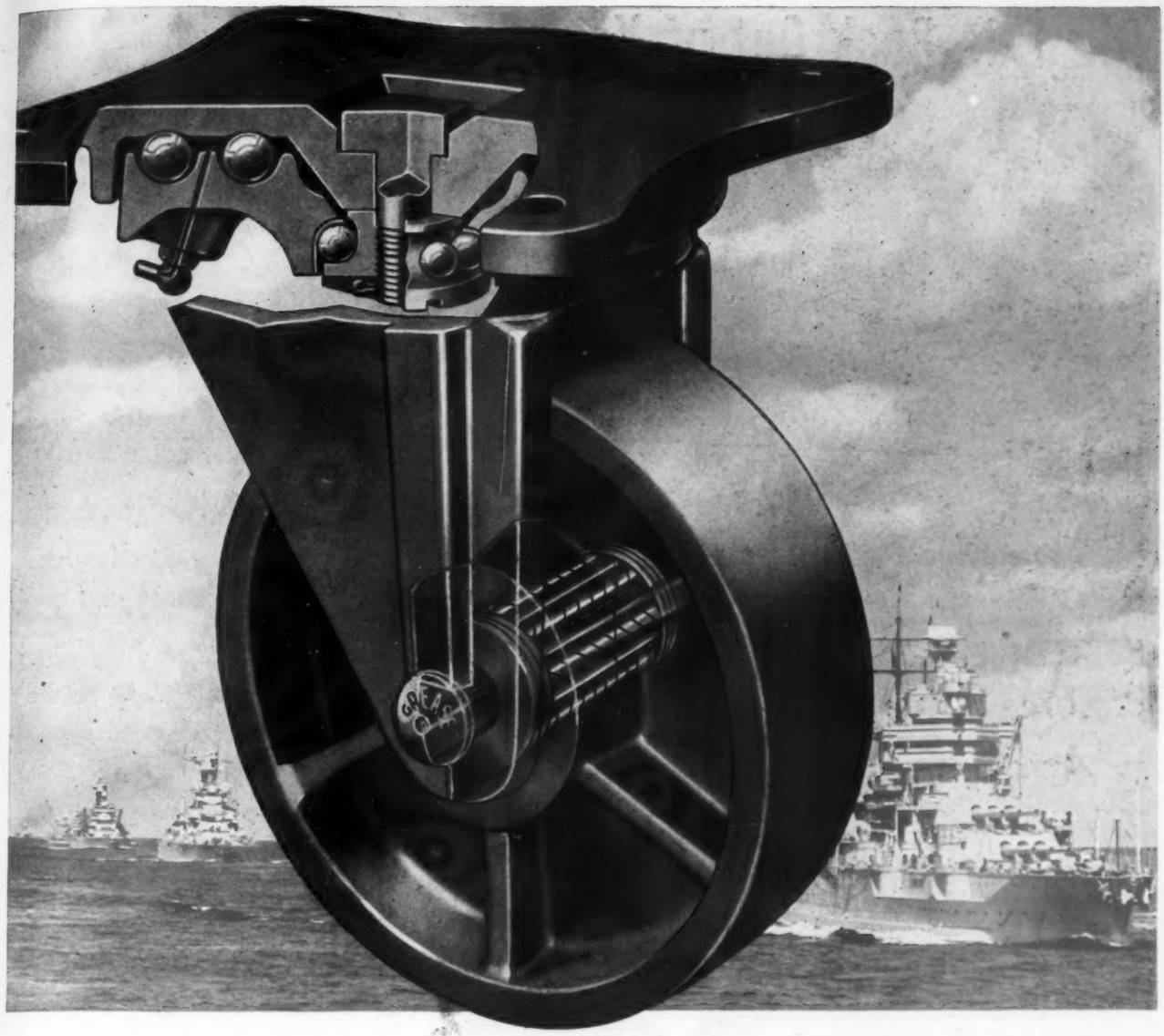
2. PUBLICITY AS A WEAPON OF ENFORCEMENT. General Motors defiance of the Boards' ruling occasioned the first public hearing to receive testimony in the company's refusal to comply. The public rebuke administered by the Board brought an immediate retraction and agreement by the company to continue for several weeks payment of double time for Sunday work pursuant to a contract, which had already expired, pending final determination.

NATIONAL LABOR RELATIONS BOARD

Practices Held to Be Interference

Communication of disapproval of outside union by making the so-called happy-family appeal to employees, constitutes such an indirect way of favoring inside unions as to amount to an interference. (Germain Seed & Plant Company.)

Urging employees to join even a



Only DREADNAUGHTS *have it*

STRENGTH . . . STAMINA . . . SPEED in moving tremendous tonnages of fighting material is what counts today, on land and sea. For this super-task, only Dreadnaughts can qualify. And, we're proud that America's defense industries are relying on Faultless *Dreadnaught* Casters for their extra strength—their ability to move heavy loads with minimum effort and wear. For, here is a super-caster with wheel, horn and plate of semi-steel —a tough metal noted for its fracture-proof qualities and resistance to heavy shocks. Note, too, the triple ball race—the roller bearing in the wheel; no matter how huge the load, *this* caster swivels and rolls freely . . . keeps vital production lines moving full speed ahead. If *your* production must be accelerated, if your equipment needs replacement or modernizing, simply write or wire. Our half century of specialized experience is available, without obligation to you.

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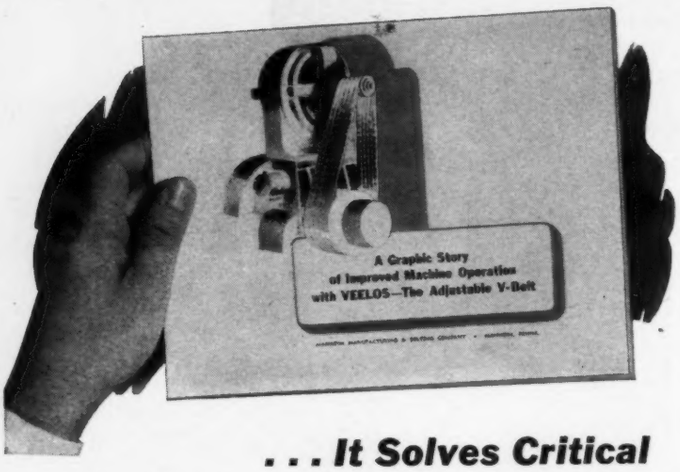

. . . It Solves Critical Wartime Production Problems

THIS one handy reference may help you save production time . . . operate machines at greater capacity . . . make more effective use of power. It's probably in your files . . . dig it out and keep it at your fingertips! It's the Veelos Picturegraph . . . the concise, picture story of Veelos—the adjustable V-Belt. If you haven't yet obtained your free copy, just drop us a note today.

VEELOS SAVES RUBBER! Patented link construction gives Veelos greater flexibility although the rubber content of Veelos is less than half that of endless V-Belts.

VEELOS SPEEDS-UP PLANT CONVERSION! Veelos simplifies plant layout and machine design . . . can be adapted to any length drive . . . imposes no fixed distances.

VEELOS PROTECTS BEARINGS! Link construction makes it easy to maintain correct tension on *each* strand of a multiple Veelos drive. This eliminates a common cause of bearing failure—the practice of adjusting belt tension by increasing distance between motor and machine.

MANHEIM MANUFACTURING & BELTING CO., MANHEIM, PA.

VEELOS
V-BELT
ADJUSTABLE to any length
ADAPTABLE to any drive

✓ CHECK!

OCTOPUS FLAT TRANSMISSION BELTING is the belt research endowed with greater resilience and more powerful grip. Ends slippage and stretch.

✓✓ DOUBLE CHECK!

KEYSTONE CANVAS STITCHED BELTING can be shipped in a week or less. It's the answer to any "S.O.S." for conveyor or elevator belt.

national union such as CIO rather than AFL amounts to interference despite the fact that it cannot be said that the management was guilty of company domination.

Celebrating the achievement of an unprecedented peak in production through a bonus may be an unfair labor practice if such bonus coincided with the efforts of an employer to enlist the support of his employees for a grievance committee. (AP. Parts Corporation.)

Insistence by an employer on individual contracts, waiver of the right to strike, and discharge of members of a committee which protested as a body against such contracts, were held to be such unfair practices, as to justify reinstatement and discharge of replacement employees. (Bear Brand Hosiery Company.)

Employee May Enforce Contract

A union's agreement to confer benefits on an employer was held to be sufficient consideration to support an obligation on the part of the employer of such an agreement and is enforceable by the employees for whose benefit the contract was made. (Levine vs. Meizel.)

Computing Back Pay

For discriminatory failure to rehire workers dismissed in a slack period, the Labor Board ordered back pay to be computed from the time the number of employees was increased to a number in excess of that remaining immediately after the lay-off. (Marlin Rockwell Corporation.)

Back Pay Ordered Paid to Employees Who Did No Work

Following an earlier Supreme Court ruling in the Phelps-Dodge case requiring management to hire an employee whose application for employment was discriminatorily refused, the Circuit Court of Appeals ordered the hiring of 27 union members. This means they were on the payroll since the time of refusal to hire them, although they did no work at all.

For the employees to be entitled to the benefit of such a ruling the employer must have known that the applicants were union members and refused to hire them because they were union members. (Chattanooga Bakery.)

**Labor Dispute Further Widened*

The Federal District Court widened the meaning of the term "labor dispute" when it refused to enjoin a union from withholding its labor be-

IDLE TIME works for the enemy today!

Save Time by specifying Jenkins Valves...for Replacements...New Installations!

TODAY, THERE IS an extra risk of breakdowns in almost every plant.

For valves now in service were probably installed for peacetime service . . . not for war's demands of three-shifts-a-day, seven days a week! And when these valves give out, and have to be replaced, precious production time is lost!

So make your present valves last. And when you replace them, specify valves that will give long, trouble-free service.

Specify Jenkins Valves, for replacements and new installations. Thousands of valves now in operation, are proving that Jenkins Valves have an extra *quality margin* that gives them longer trouble-free life — that saves lost time due to breakdowns.

Yet Jenkins Valves cost no more to buy; actually cost less to use! Available quickly . . . stocked by good supply houses everywhere!

ALL JENKINS VALVES CARRY THE DIAMOND - AND - SIGNATURE MARK

TRADE JENKINS MARK

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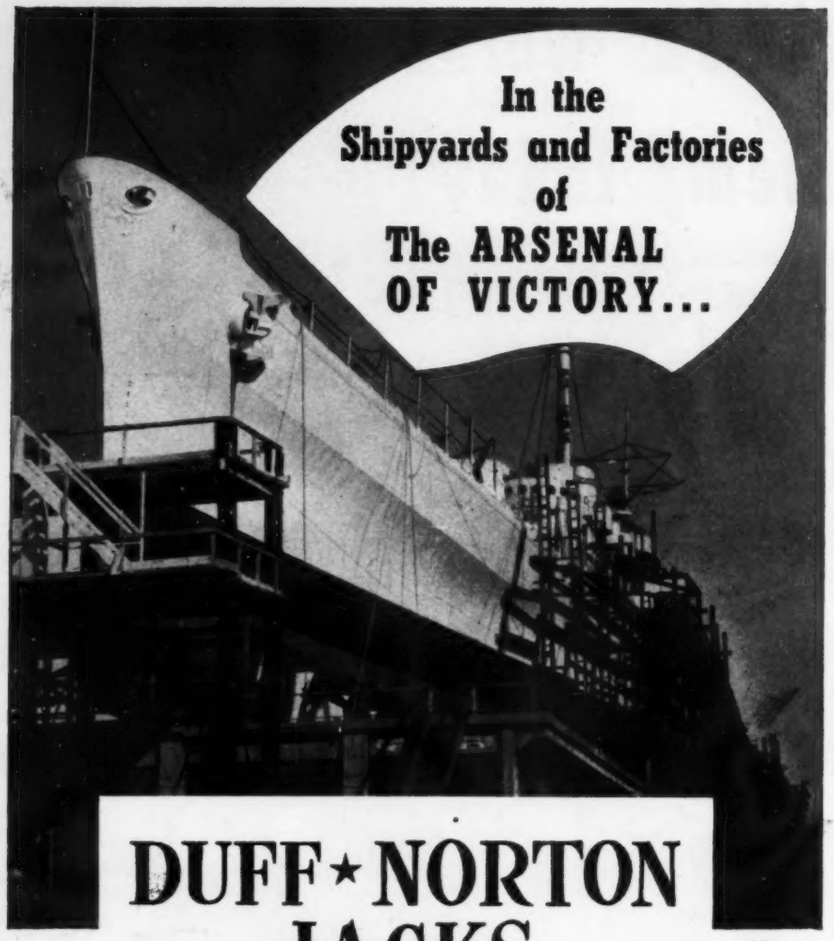
JENKINS VALVES

For every industrial, engineering, marine and power plant service . . . in Bronze, Iron, Cast Steel and Corrosion-Resisting Alloys . . . 125 to 600 lbs. pressure.



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JACKS

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serve faithfully and well!

Ball Bearing Screw Jacks for Extra Heavy Duty.

● Wherever you find men at work—helping produce the ships, guns, tanks and tools that will win the war—you'll find Duff-Norton Jacks providing "mechanical muscles" to speed the fight for victory.

No matter how tough the job—no matter how gruelling the service, Duff-Norton Jacks are doing faithfully and well every kind of lifting, lowering, pushing, pulling.

Over 300 types of sizes of these husky Jacks stand ready to help you meet production schedules. Every Duff-Norton Jack will give you safe, dependable, efficient service.

Low Height Journal Jacks.

Send for 64 page catalog

Catalog 200 will provide you with 64 pages of valuable Jack data—complete specifications on the entire Duff-Norton line. Write for your copy today!

Bell Bottom Jack Screws.

"The House that Jacks Built"
THE DUFF-NORTON MANUFACTURING CO.
PITTSBURGH, PENNSYLVANIA
Canadian Plant: COATICOOK, QUEBEC
Representatives in Principal Cities

cause the employer refused to pay the customary fee to join an employer-union board. The court rejected the contractor's claim that the exaction of the fee was pursuant to an unlawful conspiracy. (Peterson vs. Master Plumbers' Association.)

Picketing Held Unlawful

Further rumblings on the subject of picketing were heard in a California case. Milk distributors who wished to work for themselves were picketed by a union which sought to compel them to hire help. The picketing was exercised against the brokers who supplied the distributors with milk. The California court allowed an injunction on the ground that the picketing was for an unlawful activity. (Bautista vs. Jones.)

Injunction Against Shop Granted

An injunction was used to prevent a union from compelling stoppage of materials in an effort to impose a closed-shop contract on an interstate dealer. In granting the injunction the Court pointed out that a petition was before NLRB on whose decision depended the lawfulness of any contract the union might make with the dealer. (Kaufman vs. Amalgamated Meatcutters.)

New Assembly Layout—20 Percent More Output

(Continued from page 89)

long benches, often amounted to 20 or 30 feet. Reaching to the opposite edge of the 48-in. table entailed movements unnecessarily fatiguing for the worker.

The answer to our problems proved to be circular and horseshoe-shaped benches. Perfume atomizers are assembled on, or rather around, the circular stand (Figure 1); medicinal atomizers on the horseshoe table (Figures 2 and 3). With the perfume atomizers there are so many varieties, and the sizes of the batches differ so widely, that balance of operations is impossible. Therefore it is necessary to have some means of storing between operations that will not damage surfaces. More of a flow is possible with medicinal atomizers, so there is no need for much storage space between operations. There is still some lack of operation balance, however, and the horseshoe bench reduces the amount of walking—in some cases from 30 feet to four feet.

With the horseshoe assembly bench

MOBILIFT
PUTS MATERIALS ON THE MARCH!
★ This MODERN DESIGNED lift truck speeds-up "inside" transportation in war production. Mobilift does the work of up to seven people and releases able-bodied men for other branches of Uncle Sam's service. You owe it to your business to fully investigate the EXCLUSIVE features of Mobilift, the ORIGINAL low-priced lift truck. Moves, stacks goods up to a ton. Mobilift's MODERN DESIGN eliminates gear shifting; operator devotes full attention to load and the safety of others. Maneuvers better in narrow aisles, freight cars, trucks. Write factory for additional details and name of nearby Mobilift engineer. VAUGHAN MOTOR COMPANY, 816 S. E. Main Street, Portland, Oregon.
MOBILIFT
MOVES MATERIALS LIKE A GIANT

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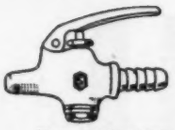
If You're Making Essential Products We'll Give You Prompt Deliveries

The items illustrated are just a few of the many types of fittings made by this company, for handling air, water, steam, oil, and electricity.

We are equipped for volume production of these fittings, as well as special items of this general character. If you are making war materials or essential civilian goods, we will gladly work with you and give you prompt, dependable deliveries of any type of brass or copper goods that we are equipped to make.

Write for our catalog of Industrial and Electrical Fittings—or submit your special requirements to our engineering department.



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HIGH PRESSURE COUPLINGS

For heavy duty service on steam, air, or water hose.

BARREL FAUCETS

Improved design, extra large capacity. Two types of locking levers.

FUSIBLE PLUGS

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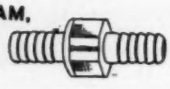

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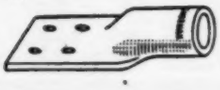

Also . . .

SOLDERLESS CONNECTORS
FIXTURE CONNECTORS

SET SCREW CONNECTORS
SPLICING SLEEVES

the material supply is serviced from the outside curve and the workers are not interfered with at all. Slide feed bins or inclined tote boxes make it possible for operators to get parts with an arm movement instead of the trunk movement that was necessary with the old rectangular bench. Utility lines and exhaust ducts are placed on the outside away from the working space. The sheet-metal chute shown in Figure 2 delivers flat packing boxes from the floor above to the packing position on the horseshoe; the packaged product is placed on the truck, and wheeled to the finished-stock room by the stockhandlers.

Perhaps it should be mentioned that the height of this bench from the floor varies from 30 to 36 inches. This is done so that with various sizes of products the operator's forearm will form an angle of about 90 degrees with the upper arm—the most comfortable working position.

The Circular Bench

The circular perfume atomizer set-up is not an assembly bench, but a means, first, of moving material between assembly positions; second, of acting as a container of materials banks between operations. It will be remembered that operations here cannot be balanced, and that a great variety of products and batch sizes are run over the same unit.

Four circular shelves are supported on flanges attached to the upright by setscrews. Each shelf may therefore be moved independently of the other three. A sheet metal apron is attached to each shelf, except the top, to limit to 20 inches the reach operators must make, and thus avoid fatiguing trunk movements in reaching for material.

The first operator gets parts from a bin supplied by stockhandlers. The results of her operations are placed on the bottom shelf. The second operator takes these partial assemblies from the bottom shelf, performs her operation on a bench adjacent to the perimeter of the circular table, and places the result on the second shelf. This procedure continues till the completely assembled product reaches the top shelf. From this point it is removed by the packer who stands in front of the box chute leading from the floor above.

An important advantage of the circular set-up is that the worktable of each succeeding operator, after the first, is raised to a height suited to the shelves from which and to which she is working.

Another advantage of the circular stand is that more than one batch may be in process at the same time. It will be observed in Figure 1 that

NO SOONER SAID than Done

THIS BROCHURE will help any producer of War Materials determine where Lyon facilities can help him accelerate production. A copy is yours for the asking.

MORE THAN A YEAR'S EXPERIENCE EXPEDITING WAR CONTRACTS FOR *FABRICATED METAL PARTS*

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Lyon field men are specially trained to gather all pertinent facts for matching our facilities with your needs. At daily meetings of our War Production staff—where all major departments are represented—plans are laid and synchronized for speedy handling of every commitment. Well into its second year of continuous operation, Lyon's War Production Staff provides a working knowledge of War Order Requirements and Procedures difficult to duplicate.

Ready to advance the staff's plans into production is one of America's best equipped organizations for fabricating sheet metal. Lyon's big, modern plants cover an area of over half a million square feet. Completely equipped toolrooms assure prompt production and maintenance of all necessary dies and jigs.

So, if you have products or parts of products to be made for Uncle Sam that require fabrication of No. 8 to No. 30 gauge sheet steel . . . turn to LYON for ACTION. We have the facilities to make such products in large quantities . . . to have them ready when you need them. Write for brochure, "Craftsmen in War Production."

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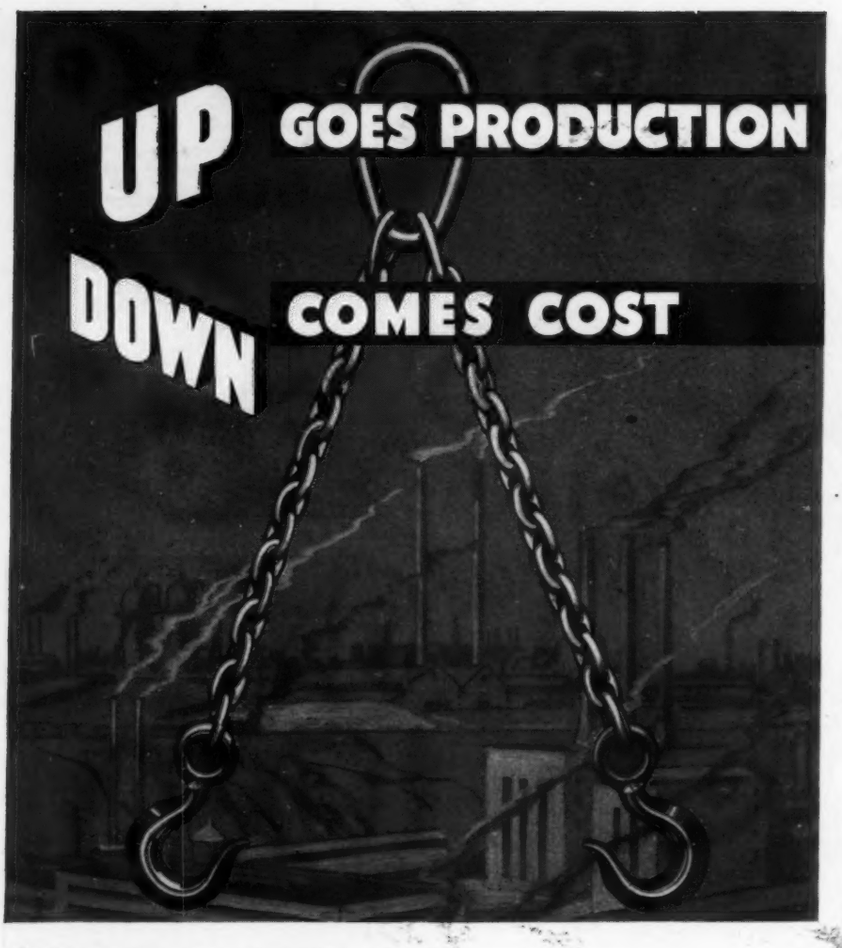
LYON METAL PRODUCTS, INCORPORATED



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double STRENGTH SERVICE SAFETY

Smooth movement of materials through manufacturing departments means more profits. Herc-Alloy Sling Chains, America's FIRST alloy sling chains, are facilitating speedy production, safeguarding men and materials, and reducing costs in every type of industry.

Fabricated from a high-grade alloy steel of nickel and molybdenum, Herc-Alloy Sling Chains have the endurance and stamina to withstand the toughest industrial assignments. Heat treating under rigid pyrometer control insures uniformity and ductility. Herc-Alloy Sling Chains never crystallize or develop grain growth ... therefore, they NEVER require annealing. Links are electric welded by the patented "Inswell" process providing 25% more metal at the critical point in the link ... at the weld. For double strength, service and safety, plus cost-cutting performance, specify Herc-Alloy Sling Chains.

CM manufactures a complete line of chain for every application. Trained engineers are available for consultation on your chain problems. Write for Herc-Alloy catalog today.

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two different glass containers are being assembled by the two operators in the foreground. If one operator works up a bank of completed subassemblies at a short-cycle operation, she can shift her position to another point and continue.

The number of operators who work at the circular and the horseshoe units varies from three to five, depending upon the character of the product. The operators are well satisfied with the new arrangement, because difficult and tiring body movements, and fatigue caused by hesitation, choice, and confusion are eliminated.

Saving in floor space of 20 percent has been made. The old rectangular benches required a space five bays long by four bays wide; the horseshoe units require, for the same production, one bay less throughout the width of the assembly floor. And costs, too, have been lowered about 20 percent, through increased production, and by reduction of spoilage and breakage.

Do Workers Want to Manage?

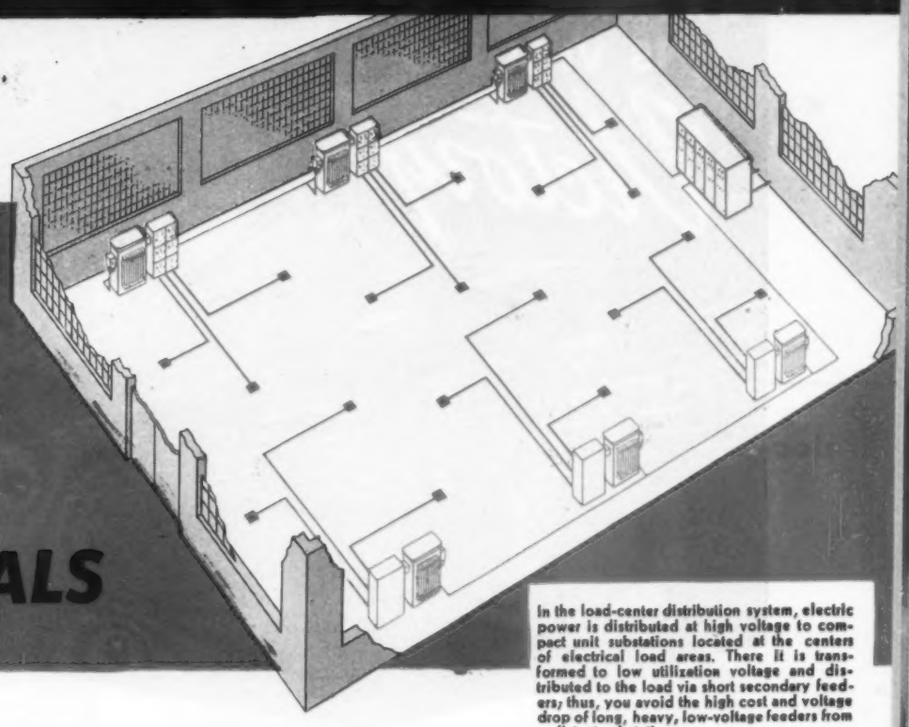
(*Continued from page 93*)

committee—and so, several years ago, threw these two out the window. In Italy, Mussolini first gave the unions a share in managing both national industry and government. But shortly afterwards he proceeded to name all their local and national officers. Here in America, the need of any such political and class arrangement has, from the beginning, been obviated by the way our managerial group has always been recruited from those wage earners who fitted themselves to carry both responsibility and authority by the gradual enlargement of their individual job experience and their intelligence.

But whatever the motives behind the demands of these (few) leaders, industry will be unwise if it fails to take advantage of the war crisis for, first, utilizing to the full the worker's expert knowledge of his own machine and job, and, second, by gradually increasing the worker's understanding of managerial problems through gradually enlarging his daily experience. Certainly our productive capacity would be increased and our entire American way of life be made much more secure if, by following Mr. Nelson's suggestions, our worker-citizen were to be helped by his experience to perceive that the manager's job is daily to secure a working, a dynamic, *equilibrium* among the always com-

LOAD-CENTER DISTRIBUTION

The NEW and BETTER WAY to distribute ELECTRIC POWER



SAVES TIME, MONEY AND VITAL MATERIALS

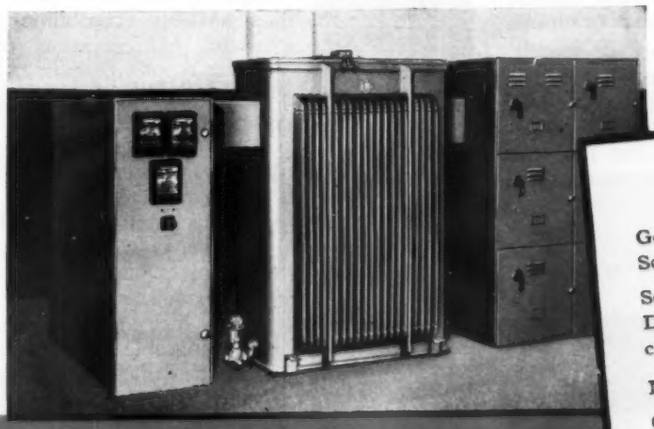
In the load-center distribution system, electric power is distributed at high voltage to compact unit substations located at the centers of electrical load areas. There it is transformed to low utilization voltage and distributed to the load via short secondary feeders; thus, you avoid the high cost and voltage drop of long, heavy, low-voltage feeders from a distant substation.

HERE'S the answer to the pressing problem of providing a reliable distribution system, quickly and economically, in today's rapidly expanding plants —the LOAD-CENTER system.

Load-center distribution enables you to install a *better* distribution system in several weeks' less time, at lower over-all cost, and with far less copper and other vital materials than are required for an old-style system. Furthermore, the flexibility of your electric system is increased, engineering and planning time is reduced, and purchasing is considerably simplified.

Basic element of the system is the "packaged" load-center unit substation—a compact, factory-built, entirely co-ordinated unit that's delivered ready to install right in the same room with the machinery to be supplied with power. Thus, you can add substation capacity WHEN you want it and WHERE you need it, largely eliminating the high cost of long, heavy low-voltage circuits from a distant substation. Voltage drop, too, is greatly reduced, thus improving the performance of your electric equipment.

LOAD-CENTER DISTRIBUTION IS FLEXIBLE
Four basic circuit arrangements offer various degrees of service reliability with corresponding variations in first cost.



Load-center unit substations, basic element of the G-E load-center distribution system, are quickly and easily installed (either indoors or outdoors) at comparatively low cost. And they're entirely metal-enclosed for increased safety.

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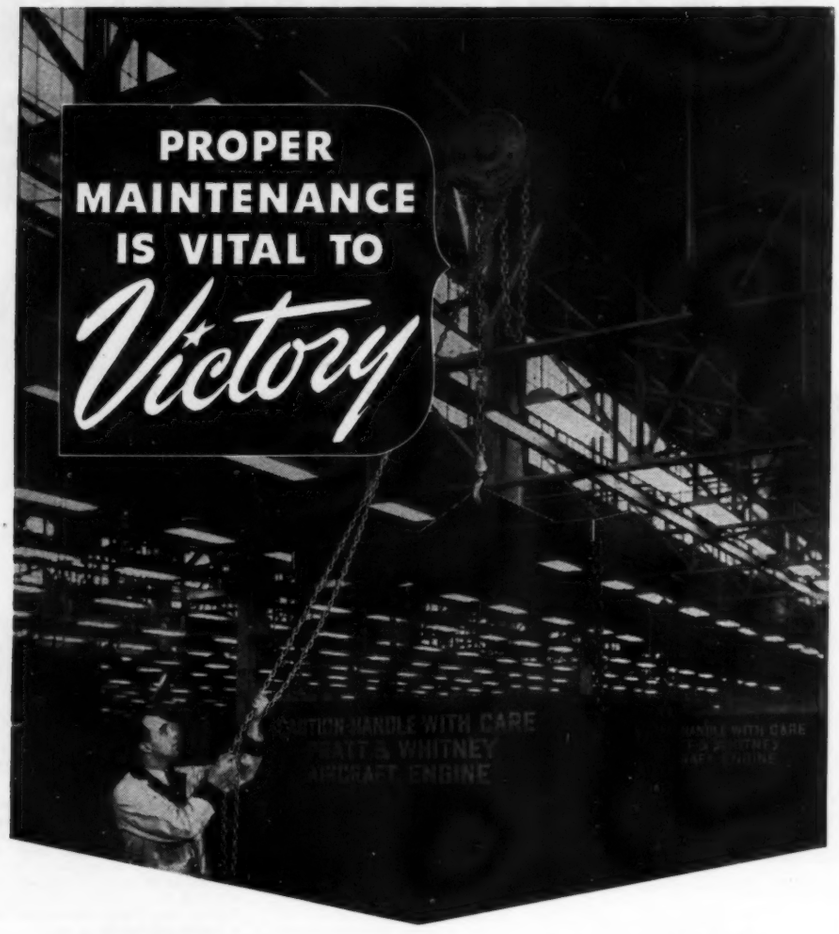

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The No. 1 precaution is: ***Don't Forget the Grease Gun!*** A busy **WRIGHT HOIST** needs thorough lubrication once a month. Keep your load chain well lubricated, too.

Wright's No. 2 precaution is: ***Don't Overload Your Hoist.*** Watch both the top and bottom hooks if in doubt about the carelessness of workmen. Wright hooks are drop-forged from special steel which, when overloaded, give visible warning by slowly opening. Wright load chains are also high in elastic limit. Don't continue to use hooks or chains that have stretched.

Take proper care of your **WRIGHT HOIST** so that it lasts. Where properly lubricated and maintained, many **WRIGHT HOISTS** have given continuous, trouble-free service for 20 to 25 years. You can find the name of your nearest Wright distributor in the telephone book.

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peting yet always common interests of owner, worker, customer, and public; that, in our competitive democratic system, the moment he fails to secure this equilibrium, his enterprise is likely to be no longer a going concern, to the hurt of all these groups.

"When our union committee men want to appear tough," so a personnel manager related a few days ago, "they tell us how 'After the war, by G—, we're going to put this outfit on the right track by busting into ownership with money taken from our union treasury.'"

Who's afraid of that kind of big, bad wolf? The limitation of their experience to one side of the conference table has kept them from perceiving that the moment they enter the manager's office as both employees and owners they are likely to find themselves no longer his enemies but his partners. To protect their wages, their dividends, and their capital, they would soon be forced, willy-nilly, to start worrying about costs, prices, reserves, bank loans, depreciation, and all the rest. Long before their worries ceased, they would pretty surely come to an astonishing appreciation of all the skills, techniques, facts, figures, and intuitions that comprise the tools of every effective manager.

Never a Better Time

It is by no means inconceivable that this approach to the sharing of ownership, authority, and responsibility, and its byproduct appreciation of managerial functions, might result from the nation's present stimulation of unions. In any case, the manager could certainly never hope for a better time than now, either to secure from his workers all that they can contribute from their daily job experience or to give to them all possible opportunity gradually to enlarge their experience, understandings, and abilities. For now, at this moment, Washington is complaining of the same obstructive bottleneck in managerial brains and know-how that the manager is encountering in the field of supervisory capabilities inside his plant. At this same moment, also, come reports that, in both the Army and our factories, the privates and minor officers show bothersome reluctance to accept the heavier responsibilities of promotion up the line.

To take advantage of this present opportunity, the manager need remember only this one thing—that his employees understand management little and distrust it much, not because they are a certain fixed and unchangeable species called wage earners, but because he has too often failed to explain his problems to them

"how about portable tools in our new plant—which type is best for us?"

BASIC ADVANTAGES of the Three Types of Portable Power Tools

Available for a wider variety of applications than any other type.

Generally of more rugged construction.

Cannot be damaged by overloading.

Easily stand up under the hardest kinds of heavy duty service.

Run on ordinary AC or DC electric current which is available almost everywhere.

Offer a wide range of models for all kinds of production and maintenance.

Installation costs generally lowest of all.

Lowest operating costs for users of ten or more tools.

Maintain virtually constant speed under load.

Nature of high frequency current permits simplified construction for light weight, easy handling, reduced maintenance.

• Selecting portable tools while you are still in the *planning stage* of plant expansion is the most sensible way to insure peak production later. For remember, there are three different types of portable power tools — Pneumatic . . . Universal Electric . . . and High Frequency Electric — and one almost certainly offers significant advantages over the others for your particular work.

Which shall it be? Answering this important question calls for specialized knowledge and competent study. It's an assignment that *Thor* is especially well qualified to undertake for you because:

Thor makes all three types of portable power tools.

Thor has the engineering "know how" that comes from building good tools for nearly fifty years.

Thor is working continuously to make the good tools of today even better tools tomorrow . . . to develop new tools for new applications.

Thor has the trained Service Engineers to put this advisory service into practical operation.

Before you tool up, get this expert, impartial advice. Plan your application of portable tools *in advance* — and get peak production! For further information, without obligation, write Independent Pneumatic Tool Company, 600 W. Jackson Blvd., Chicago, Illinois.

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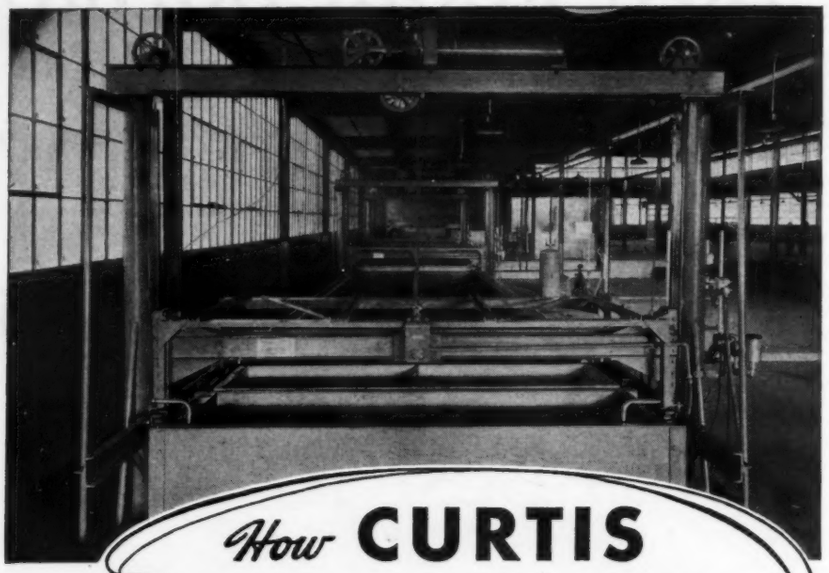
PORTABLE TOOLS

PNEUMATIC • UNIVERSAL ELECTRIC • HIGH FREQUENCY ELECTRIC

Let Thor help you get peak production with the right type of Portable Power Tools



How CURTIS AIR CYLINDERS Speed High-Production Finishing of Die Castings

★ Thanks to an ingenious application of several Curtis Air Cylinders, the automatic copper and nickel plating equipment of the Gerity-Adrian Manufacturing Corporation can now handle 270 racks of work per hour through five separate units.

Curtis Air Cylinders provide automatic transfer of work racks between the cleaning, plating, and rinsing units of the installation, which was installed by Crown Rheostat and Supply Company, Chicago. Each transfer unit is controlled by two Curtis Air Cylinders, one operating the lift mechanism vertically and the other operating the horizontal or transverse motion of the frame.

The installation eliminates lengthy drive shafts, affords any desired time cycle for the various steps in the transfer, and allows rearrangement of the entire sequence of operations at will. It greatly simplifies previous arrangements and has materially speeded up the production of finishing huge volumes of die castings.

Curtis Air Cylinders will perform almost any pushing, pulling, or lifting operation. They cannot be damaged by overloading and are immune from abuse. They provide exceptionally accurate control; easily operated by unskilled labor.

Hundreds of industrial plants are saving time and money, speeding up production, with Curtis Air Cylinders. Write for free booklet, "How Air Is Being Used in Your Industry," and full information on Curtis air operated equipment.

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Please send me your free booklet "How Air Is Being Used in Your Industry" and further details concerning Curtis Air Hoists.

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City.....State.....

in terms of their experience and interest. He may have "told" them but he has hardly "sold" them.

"When we talked of our company's debts," relates a certain sawmill superintendent, "our men gave us nothing but a lot of so-what? looks. But when we put a red tag on every log in the pond that had been bought with a loan from the bank, they began really to spit on their hands."

Today many Americans have been surprised that, for the prosecution of the war, British workers have not elected a Labor Government. The reason is that those British workers know well that their party leaders have not had enough experience with international affairs to give them the practical know-how required for world-war victory. It has to be said, however, that those same British workers feel closer to their country's war effort than do ours here. The reason is that, because of their greater dependence on export trade, they have for generations experienced the multitude of impacts on their daily jobs caused by their country's varying commercial and political relations with the rest of the world.

Here amongst us a certain (small) number of the leaders, not only of workers but also of farmers and voters, are assuming that, in order to hold their constituents, they must perforce keep asking:

"How can we help them get *theirs*?"

They fail to realize that, since Pearl Harbor and Bataan, their constituents have been asking:

"How can we help? How can we *give ours*?"

I believe these individuals would, like their leaders, be happy to enjoy the sense of importance gained by a larger share of management's responsibilities. But, unlike their leaders, they believe the present occasion too vital to justify such sharing on the basis of any political, class, or union demand or of any "right" except that of their demonstrated individual ability to be genuinely helpful.

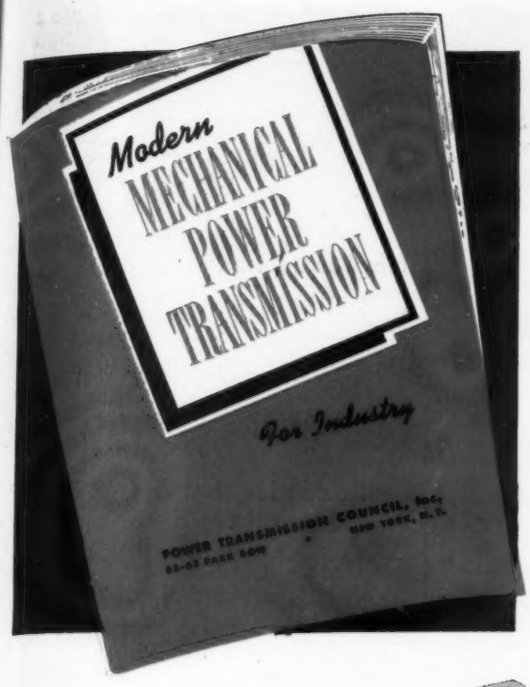
Carter Products, Incorporated

(*Continued from page 96*)

want us to do, run your shop for you?"

"No. What I want is something that doesn't take one of my men several days to get to the bottom of, and that gets to me soon enough so I can do something about it."

"Weren't you the one who thought the Templeton Engineering outfit's



HOW TO SAVE UP TO 26% HORSEPOWER

HOW TO SET UP MODERN GROUP DRIVES

HOW TO MAKE BELTING LAST LONGER

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..100,000 NEW MEN IN INDUSTRY NEED THIS PRACTICAL GUIDE TO PLANNED POWER TRANSMISSION

Power on the battlefront—power on the production line! POWER is vital to win this war. And the wise and efficient use of power will speed the day of victory.

As a service to Industry and the war effort, the Power Transmission Council, Inc. offers this free book of practical suggestions on the proper application, use and maintenance of mechanical power transmission machinery.

Not a bid for orders, not a "printed salesman," but a helpful guide to the thousands of plants in America now using some form of mechanical power transmission. For, when used in a Planned Power Transmission system, this machinery saves power, improves power factor, lowers connected load, reduces maintenance and unit cost, and increases production.

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The Power Transmission Council, Inc. represents and serves impartially the manufacturers and distributors of mechanical equipment used to transfer power from the prime mover to the machine to be operated.

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This ad is inserted or the Power Transmission Council, Inc., by a manufacturer of mechanical power transmission machinery, in the interests of American industry and the war effort.

Pride of the Air Service
HANSEN MFG. CO.
HANSEN Push-tite
AIR HOSE COUPLINGS
Regardless of your air problem in the plant, Hansen PUSH-TITE air hose couplings are the answer. No matter how tough the going—Hansen PUSH-TITE air hose couplings will not leak under any pressure. There is no wasted air due to leakage and no wasted time and effort because PUSH-TITE air hose couplings are fast on the trigger—a simple push of plug into socket, it is connected air tight and air is automatically turned on, a slight pull, air is automatically turned off and coupling is disconnected. Speeds up production tremendously, no twisting or turning of parts—to connect or disconnect and the complete swivel action eliminates the customary problem of "kinks" in the hose.
Hansen PUSH-TITE air hose couplings are widely used on air, oil or grease lines, working efficiently on all three.
★ SEND FOR FREE CATALOG ★
Hansen MFG. CO.
INDUSTRIAL Air Line EQUIPMENT
1786 EAST 27TH STREET • • • • CLEVELAND, OHIO

cost report was no good? That was a day-to-day report on the plant's operating efficiencies."

"Oh, that outfit!" Sam waved his hand. "Who could understand the jumbled-up mess of figures they hatched up, anyway?"

"Well," said Jim, "it was all there. Everything you needed to know every day, right after it happened, about every department. You said it was screwy."

"Anything they hatched up was screwy," asserted Sam. "They didn't know a Perkins valve from a stillson wrench."

"Nevertheless, they had a workable report. It was thrown out at your insistence."

"I didn't like their complicated report! Can't you design something that won't require a Philadelphia lawyer to figure out?"

"Well," answered Jim, "we can try. But you want a detailed report and yet you don't want one."

At this point, the Old Man walked in. His years and health may have mellowed his one-man organization ideas, but you just can't help respecting his opinion. The air in the office became noticeably cooler when he came in. He asked what was going on. Sam explained, the Old Man nodded.

"There's one other thing," announced Sam to Jim. "I'd like to make a request that this monthly report be broken down and some explanatory notes thrown in."

"But, Sam," responded Jim with his first sign of irritation, "you're supposed to know what's causing these things. You're running the shop—not us."

"Yes. And I can't run it right with the help of reports that take me days to figure out."

"So," chimed in Jim, "you want us to figure them out for you."

The Old Man Talks Sense

Before Sam could say anything more, the Old Man cut in. "It seems to me, Jim, that Sam is right. You handle these figures every day, and understand them thoroughly. You make mental notes and comparisons that Sam can't. No doubt you could take this report and grasp every detail of it at one glance. But you worked up the figures; Sam didn't. Why not compare figures for the factory, pointing out where certain costs are rising, others decreasing, so that the boys can give them intelligent attion, and skip over the less important items?

"Shouldn't the cost reports help the factory in every way possible to operate at the lowest possible cost? That the factory men know the facts and

No need of a blackout inside a plant . . .

Consider the blackout. It aids all-out production by affording factory protection against enemy raiders that fly by night.

But blackout conditions *inside* your plant will sabotage your Victory effort. Inefficient light in a factory wastes electric power and money—tires workers needlessly—lowers production!

Johnson's Wax-Fortified Paints (high-quality paints fortified with *wax*) *increase light reflectivity up to 20%*. This is because the wax, which permeates the paint film, leaves a smooth protective wax finish on the painted surface *to which dust and grime do not readily stick*.

Careful analysis of users' experience has established that Johnson's Wax-Fortified Mill White (1) loses practically none of its light reflective values after months of ordinary exposure; (2) requires less frequent cleaning or repainting; (3) cleans easily when cleaning eventually becomes desirable; (4) cuts maintenance costs substantially.

Wax-Fortified Paints and Enamels are exclusively made by Johnson. There is a full line for almost every industrial and commercial use. Won't you discuss with us their application to your plants and buildings? S. C. Johnson & Son, Inc., Industrial Maintenance Division, Racine, Wisconsin.

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WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
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what's behind them, is a lot more important than that you and I know them. They can do something about things that are wrong; we can't."

Sometimes I wish the Old Man were younger, although they tell me that in his day he had little use for any reports. Just to walk through his plant was enough for him. He knew instinctively whether things were right or not, and used only a monthly general report to tell him what he needed to know.

Several days later, I stopped in to see Kirk Lansing, Jim Racine's assistant, and he was painstakingly doping out a daily cost report.

When I asked him how he was making out, he said, "I don't know yet. I know what kind of report I'd figure out, if I had the say, but I've got to make this thing please other people."

"Why's that so difficult?'

"Because what Jim told Sam Holland the other day is essentially true; that is, about Sam having had once before the kind of report he's asking for now, and being against it."

"Why was he against it?" I queried.

"Because," Kirk said, "it was advised by Templeton Engineering Company, when they were here two years ago. Sam got on the 'outs' with them, and decided everything they advised was cockeyed. Their report had everything—departmental efficiencies, percent of hours on standard or day work, losses due to day work, breakdown of equipment, excess set-up costs, waiting time, total departmental losses per standard hour, and anything that put the finger on accurate cost control. It was a honey. The cry then was that it was too complicated, and required too much money to work up. Actually, if it had been used, it would have saved many times its cost. I'm trying to make up another report that will do just as much good, if used, but which will not look like Templeton's."

"What about the monthly reports?" I wanted to know.

Point Out Important Items

"Sam was right about that, and we had never seen the matter just the way the Old Man put it the other day. As requested, we're going to point out the important and changing items. We're going further than that. We shall make up a series of simple cost graphs that show month to month comparisons on the important items, such as total volume of production compared with overhead, plant costs per standard hour, and the like."

"It sounds," I remarked, "like good stuff."

"It will be," said Kirk.

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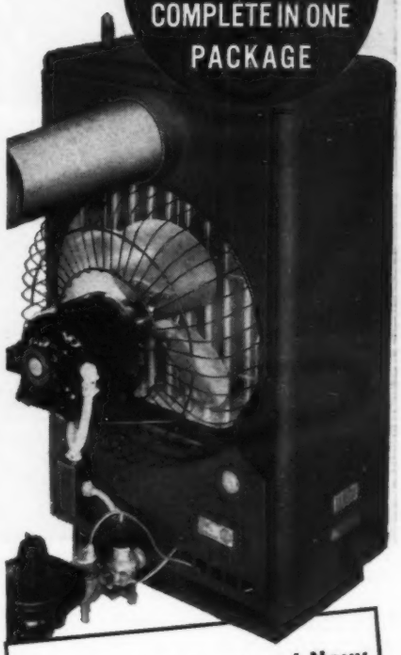

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4. Cut Production Costs
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6. Plan Future Material Handling Requirements

All Baker representatives are qualified material handling engineers. They have been in hundreds of plants, and know intimately the problems confronting you wherever materials or finished products are to be moved—in the plant, in the warehouse, on the shipping or receiving platforms, and on shipping piers—they can evaluate your complete handling set-up, and recommend the type of equipment best suited to your plant. If you are after any of the objectives outlined above, it will be well worth your while to seek advice of the Baker representative nearest you.

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Recently a manufacturer, contemplating plant expansion to meet increased production schedules, called in a Baker Engineer to discuss truck requirements. After a complete survey, the Baker Engineer submitted a plan which achieved the production objectives without plant expansion, by a readjustment of material handling facilities and the addition of new equipment, thus avoiding the expense and inconvenience of new construction.

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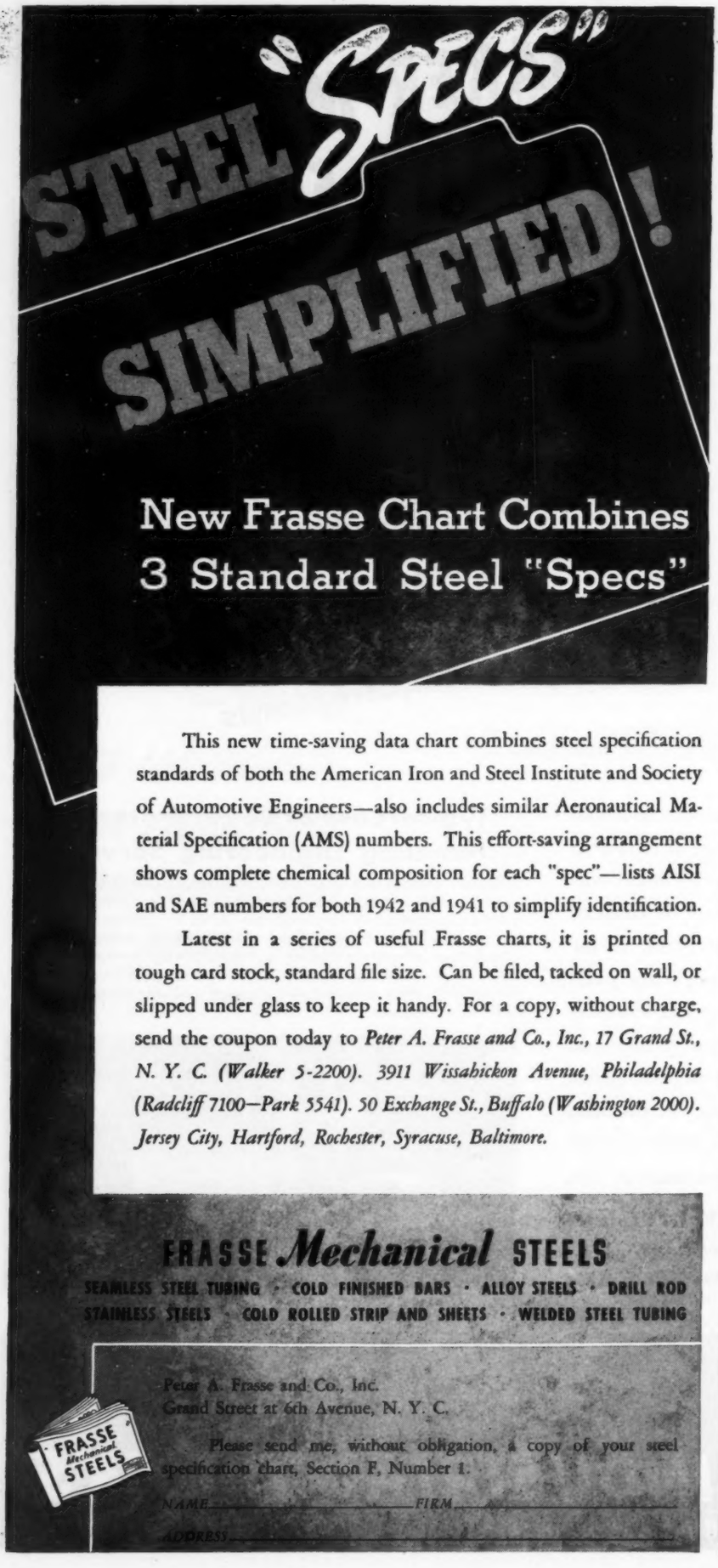
In Canada: Railway and Power Engineering Corporation, Ltd.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Keep Arc Welders Welding

(*Continued from page 118*)

With a clean screwdriver or similar tool, free the relief hole of any hardened grease so that any excess grease will run freely from the bearing. With the motor running, add grease with a hand-operated pressure gun, until it begins to flow from the relief hole. Allow the motor to run long enough to permit the rotating parts of the bearings to expel all excess grease from the housing. This very important step prevents overgreasing the bearing. Then stop the motor and replace the relief plug.

On a motor that is not equipped with the pressure gun fitting and relief plug on the bearing housing, disassemble the bearing housings and clean the inside of the housings and housing plates — or caps — and the bearings with carbon tetrachloride, and reassemble all parts except the outer caps, or plates.

Apply new grease, either by hand or from a tube, over and between the balls. The amount of grease to be used varies with the type and frame size of the motor. The instruction sheet which accompanied the welder should always be consulted for this information.

Correct Amount of Grease

Addition of the correct amount of grease fills the bearing housings one-third to one-half full. More than the amount specified must not be used. When reassembling the motor, any V-grooves in the housing lip should be filled with grease — preferably a fibrous, high - temperature - sealing grease—which will act as an additional protective seal against the entrance of foreign particles.

The pressure relief method of greasing motors tends to purge the bearing housing of used grease. Complete cleaning of bearings, therefore, is required at infrequent intervals only. When the bearings are not disassembled, they can be cleaned by the following method:

Clean the housing, pressure gun and relief fittings, and remove both fittings. Keep dirt out of the bearings, both when greasing and cleaning them. If a bit of abrasive material once gets in a bearing it may not be removed even with the most thorough cleaning. Free the pressure fitting hole and relief plug hole of hardened grease.

With the motor running inject grease solvent into the bearing hous-

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Finally, engineering surveys show a saving of up to 47 per cent of copper, steel and other critical metal may be obtained when the MILLER Continuous System is employed, taking into account all items (power plant, distribution, controls, wire, etc.) making up the *complete* lighting installation.

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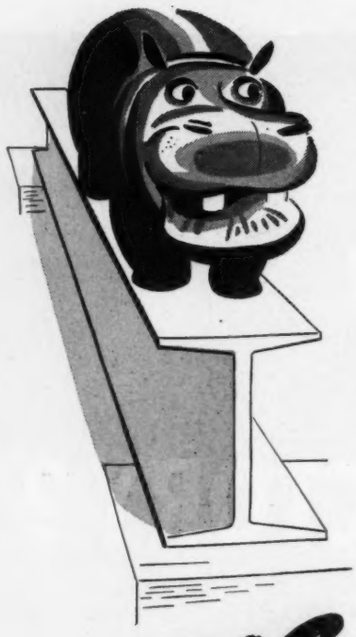

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...JUST
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WHERE THEY'RE
YEARS
AHEAD!

J-21243

WESTINGHOUSE ELECTRIC &
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E. PITTSBURGH,
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ing through the pressure fitting hole. As the grease becomes thinned by the solvent, it will drain out the relief hole. Continue to add solvent until it drains out quite clear.

Replace the relief plug and inject solvent until it can be seen splashing in the filling hole. Allow the solvent to churn for a few minutes. Remove the relief plug and drain. Repeat the churning operation until the solvent runs clean. If carbon tetrachloride has been used for flushing, replace the relief plug and inject a small amount of light lubricating oil, and allow it to churn for a minute or two before draining it off. This will flush out the solvent. To complete the job, grease the bearing thoroughly, using the method previously described.

Brush Inspection

Brush inspection is important. Free movement of the brushes in their holders and uniform brush pressure are necessary to assure equal current distribution. Brush holders should be set so that the face of the holder is approximately $\frac{1}{8}$ inch up from the commutator; any greater distance may cause brushes to wedge, resulting in chattering and excessive sparking. It is essential that the correct grade of brush for a specific application be used.

Broken brushes imply two possibilities—incorrect brush grade, or mechanical defects (such as unbalanced, rough, or eccentric commutator). To eliminate brush breakage, both factors should be corrected.

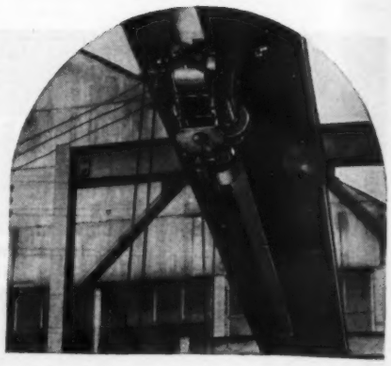
Replace brushes before they wear down too far. Never let the pigtail connection to the brush touch the commutator.

The brush surface in contact with the commutator should have an overall polished finish that indicates good contact. Always replace a brush in its original position.

Installing New Brushes

When installing new brushes, fit them carefully to the commutator. Insert a strip of fine (No. 00) sandpaper, sand side up, between the commutator and the brush. Rotate the commutator back and forth, allowing the brushes to bear on the sandpaper only when the commutator is moving in the proper direction of rotation. Blow carbon dust out of machine. Sand until the curve of the brushes is the same as that of the commutator. Be sure that brush pigtails are fastened securely.

Check the springs that hold the brushes against the commutator. Improper spring pressure may lead to excessive commutator wear and spark-



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THE problem was to boost boiler capacity—without the expense of a plant addition or new boilers. So the boilers were "built down" to increase the capacity of the fire boxes. But that brought up the problem of economical ash handling from the newly made sub-basement.

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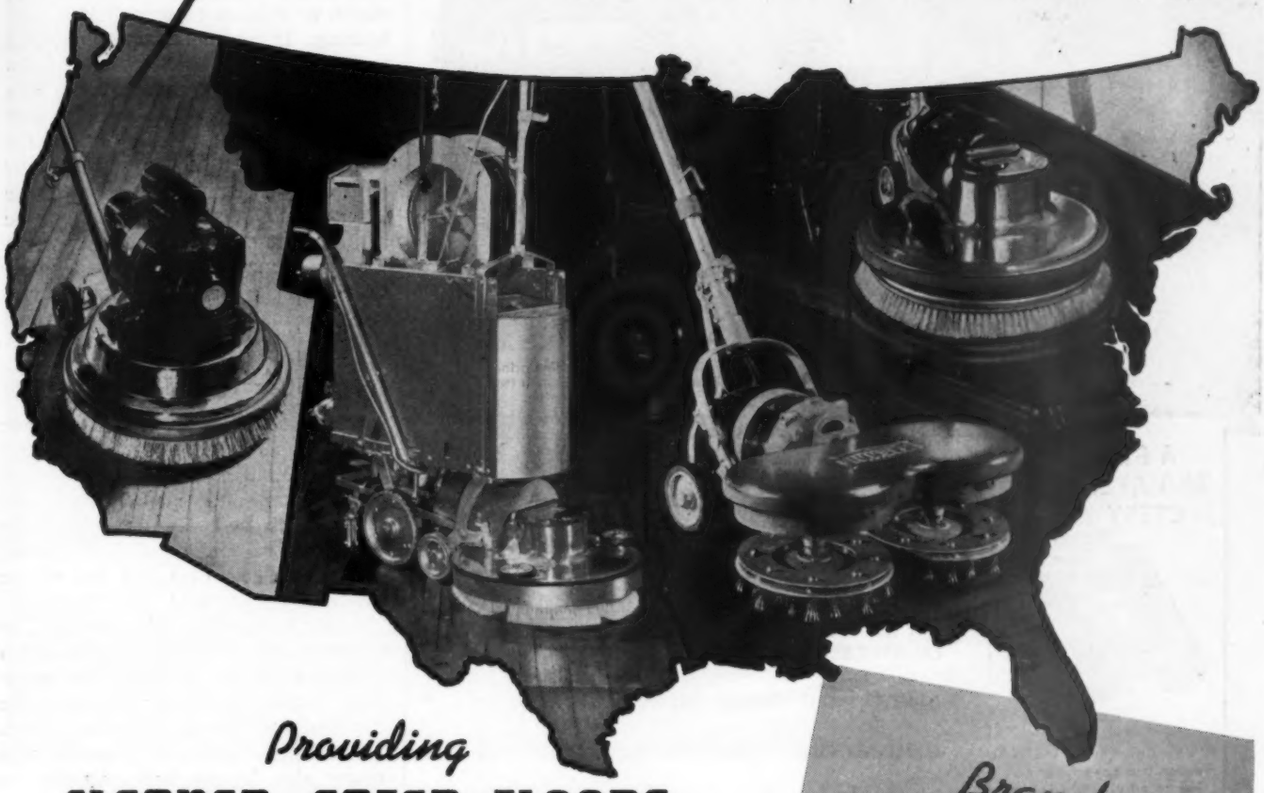

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ing. Excessive heating may have annealed the springs, in which case they should be replaced and the cause of heating corrected.

Inspect the commutator for color and condition. It should be clean, smooth, and glossy, with a color varying from straw to chocolate brown where the brushes ride on it. A bluish or reddish color indicates overheating. If the commutator is found to be dirty when the generator is inspected, it should be wiped clean with a piece of canvas or other cloth that is free from lint. Roughness of the commutator should be removed by sandpapering or stoning. Never use emery cloth or an emery stone. Use a fine stone or No. 00 sandpaper unless the commutator is in bad condition; then the job may be started with a coarse stone and finished with a fine one.

Be Careful of Live Parts

For this operation, press the stone or sandpaper against the commutator with moderate pressure with the motor running, and move it back and forth across the commutator face. Do not come in contact with live parts. Be sure to keep the dust out of the machine.

If the commutator is very rough, as evidenced by pronounced up and down vibration of the brushes, the armature should be taken out and the commutator turned down in a lathe. When this is done, it is usually necessary also to cut back slightly the insulation between the commutator bars.

Never put oil on the commutator. Proper brushes give the commutator all the lubrication required to prevent excessive wear and to build up a good, smoothly operating glazed surface on the copper.

A Minimum of Maintenance

The transformers of a.c. arc welders require a minimum of maintenance, but this fact should not be allowed to result in neglect. On fan-cooled units, fans should be cleaned and lubricated about once a year. Windings should be blown out at least twice a year, and more often in dusty places. At the time of this periodic attention, check all connections and coil supports for tightness. Manual current adjusting mechanisms should be lubricated with high-melting-point grease, often enough to prevent stiff operation of the hand-wheel or crank. On motor-operated controls, lubrication at more frequent intervals may be required, as evidenced by slowing down of the motor or noise from the gearing. This point should be checked at least three times a

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year, and more often if experience justifies it.

While most welding equipment is designed to stand up under unusually adverse operating conditions, some circumstances will cause serious impairment, if not complete interruption of their service. For example, weather-protecting tarpaulins thrown over machines in operation interfere with the free passage of ventilating air into and out of the equipment.

Keep Connections Tight

Be sure that all connections are kept tight, and are made with cables equipped with properly installed lugs or terminals. It is practically impossible to bolt or wedge untinned flexible cable to another conductor and secure a good low-resistance joint. Soldered or reliable solderless connectors or terminals should always be used.

The use of excessively long electrode or work leads, with motor-generator type welders, will result in overheating of the motor when operating in the upper part of the current range, unless extraordinarily large cables, or a number connected in parallel, are used. Overheating of the motor from this cause is a frequent reason for motor-generator welders tripping off the line.

A source of trouble that is not protected against by the motor overload relays is the application of long continued short circuits on the generator. Poor cable or cable connection insulation may be responsible for short circuiting a generator for long periods of time. This results in the flow of heavy generator current, but does not require sufficient power input from the line to cause the motor overload relay to trip. While the motor is not damaged, the generator may be seriously overheated or burned out.

Adjusting Welding Current

The use of improperly bonded structural steel systems or building frameworks for the welding current return circuit is undesirable. The high resistance path thus afforded the welding current may result in overheating of the welder motor.

No attempt should be made to adjust welding current output by any means other than those provided and recommended by the manufacturer of the equipment. Improper shifting of brushes may result in inferior welding characteristics, impaired commutation, and short brush life. Short circuiting of resistors or rheostats or any other tampering with the control may result in damaging or burning out the equipment.

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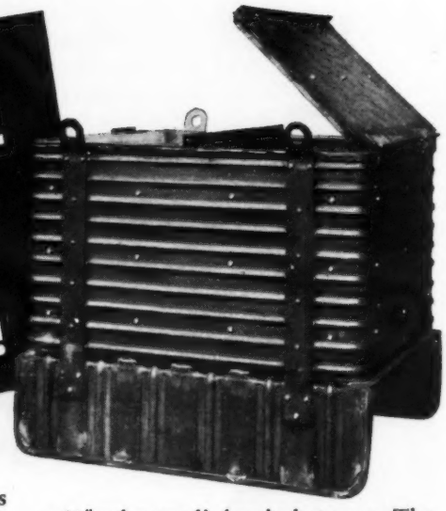

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Write for Samples and Technical Bulletin No. 83

RIEGEL PAPER CORPORATION
342 MADISON AVENUE, NEW YORK, N. Y.

of a welding equipment where it may be subject to mechanical injury is a frequent source of trouble. Portable machines should not be located in aisles where they may be struck by passing trucks, trailers, or crane loads.

In transporting welding equipment, rough handling may result in permanent mechanical damage. Motor-generator sets mounted on steel-wheeled running gear should be moved only at slow speeds—never behind fast-moving trucks or other vehicles. They should be eased over obstacles and depressions. Slings used for transportation of welders by crane should be carefully arranged to avoid damaging control boxes, handles, and other equipment mounted on the outside of the set.

Avoid using arc welders out-of-doors in unfavorable weather. Many machines now on the market are designed to be both semi-protected and drip-proof. This does not mean, however, that these welders should be used in rain or other precipitation without suitable protection.

Out-of-Doors Operation

At the discretion of the user, of course, drip-proof or even open motor-generator sets can be operated out-of-doors, provided they are protected from obviously damaging conditions by tarpaulins or temporary shelters. These must be arranged so as not to hinder ventilation of the equipment.

If a motor or generator has become wet from any cause whatever, it should be dried out thoroughly before being operated again. These methods may be used, but never raise the temperature above 90 degrees Centigrade:

1. Place the stator in an oven and bake.

2. Inclose the motor with a suitable covering, leaving a hole at the top, and insert heating units or lamps.

3. Pass current at low voltage through the stator windings. Increase the value of current gradually.

4. Dry out with portable infra-red lamps.

Drying should proceed until the insulation resistance becomes practically constant. There are many ways of measuring insulation resistance, and any equipment available can be used if care is taken not to apply too high voltage to the winding. The insulation resistance meter, of course, provides the easiest method but the voltmeter method is quite suitable.

In spite of the reliability of the modern arc welder, troubles will occur. A table listing causes of such troubles, and remedies for them can be found on page 118.

HERE'S ALL YOU NEED TO END WINDOW SASH PROBLEMS

Right now!
PC GLASS BLOCKS
— available for immediate shipment
ORDINARY MORTAR
— a regular mason can easily install glass blocks

IF you are faced with the need for replacing worn-out sash, either to repair your present plant or to rehabilitate an old one, you can take care of the problem in quick order with PC Glass Blocks. For glass block construction requires no use of critical materials in small panels—very little metal is required even in large panels. Many plant owners have set up a program of progressively replacing ordinary window sash with PC Glass Blocks. This change can be made a panel at a time, a floor at a time, or department by department.

In addition to permitting immediate construction, PC Glass Blocks provide many other advantages that result in greater plant efficiency and lower maintenance costs. We can barely mention here the many ways they can help you. But it is information you should have on hand whether you plan to build, remodel or add to your plant. Our book on PC Glass Block construction will show you how other plant owners have used glass blocks successfully. Mail the coupon below for your copy.

PC Glass Blocks give you all these advantages:

BETTER DAYLIGHTING · INSULATION
IMPROVED TEMPERATURE CONTROL
IMPROVED HUMIDITY CONTROL
LESS CONDENSATION ON WINDOW AREAS
EASIER CLEANING
ELIMINATION OF DIRT INFILTRATION
REDUCED MAINTENANCE COSTS · PRIVACY

"PITTSBURGH" stands for Quality Glass

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GLASS BLOCKS

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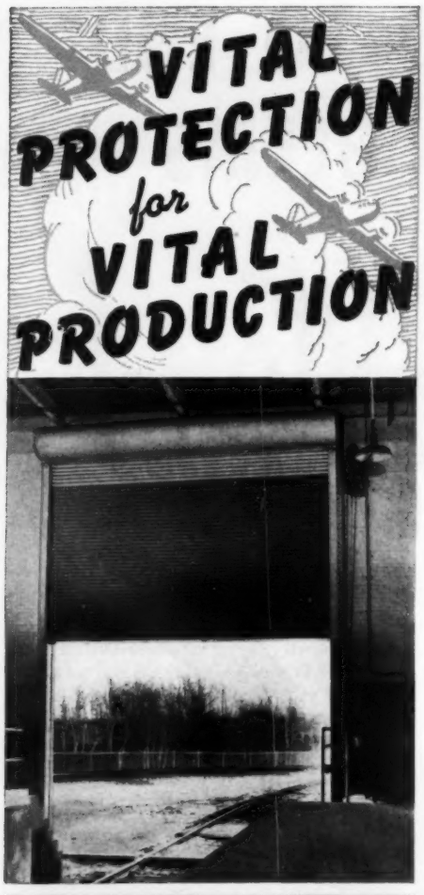

KINNEAR
ROLLING DOORS

You protect your plant in a number of *extremely important ways* when you install rugged, all-steel Kinnear Rolling Doors.

They are *strong* barriers against rioters, saboteurs, intruders. They repel fire. They defy the heaviest winds, and resist the elements. And they close *light-tight*, in case you're thinking about blackout precautions.

Kinnear Rolling Doors give you a great deal *more* than protection, too. They save floor and wall space, because they *open upward* into a compact coil. When open, they remain completely *out of the way*. Their rugged, all-steel interlocking-slat curtain (originated by Kinnear) is just *flexible* enough to absorb sharp impact or other punishment. They stand up years longer under hardest use. Easy, rapid, *counterbalanced* operation saves time and effort (motor control available). Get full details *now* on Kinnear Rolling Doors. Write today!

The KINNEAR *Mfg. Co.*
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COLUMBUS, OHIO
OFFICES AND AGENTS IN
ALL PRINCIPAL CITIES

BOOKS

DU PONT

William S. Dutton, Charles Scribner's Sons, 597 Fifth Ave., New York. 396 pages. Index. $3.

Biography of a 140-year-old business, since its establishment as a small gunpowder factory near Wilmington to today. Tells of the various members of the family, the parts they have played in the development of the business, and the effect these developments have had on the whole country.

MACHINE TOOLS AT WORK

Charles O. Herb, associate editor, *Machinery*. The Industrial Press, 148 Lafayette St., New York. 552 pages. Photographs, drawings, index. $4.

Applications of modern machine tools of various types presented by condensed illustrated descriptions of the more unusual operations. Intended for men who have a fair knowledge of machine shop practice.

THE COMING SHOWDOWN

Carl Dreher. Little, Brown & Co., Boston. 419 pages. Index. $3.

Must we have a war every generation to keep business alive, asks Mr. Dreher, who was at one time a successful cog in the business machine, and got out because he became convinced that the machine needed overhauling, if not replacement. He writes his own prescription of what we shall do to be saved—based on history. In three parts, (1) The Industrial Revolution; (2) High Capitalism; (3) To Sarajevo: The Great Explosion.

FLUORESCENT LIGHTING MANUAL

Charles L. Amick, Nela Park Engineering Department, General Electric Co. McGraw-Hill Book Co., 330 W. 42nd St., New York. 312 pages. Photographs, drawings, charts, tables, index. $3.

A practical manual of fluorescent lighting, presented so that men with electrical training can understand it. Describes construction and performance of all types of fluorescent lamps, principles and methods of calculating illuminating requirements, pointers and methods of installation and maintenance, and hints on locating and remedying troubles.

EMPLOYEE TRAINING

Alfred M. Cooper, McGraw-Hill Book Co., 330 W. 42nd St., New York. 311 pages. Index. $2.50.

Original, tested methods of employee training that are effective in producing results. Emphasizes the rehearsed-conference method, and furnishes complete course outlines, lesson plans, standard practice material, and detailed directions for the installation and operation of employee training plans. Describes all forms of vestibule, apprenticeship, and upgrading. Chapter headings include "The Evolution of Employee Training," "How to Lead a Training Conference," "Developing Supervisors as Conference Leaders," "An Effective Safety Training Program," "Public Relations Training," and others.

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"3-Shift"
Steel Tool Stand
Welded for
STRENGTH!
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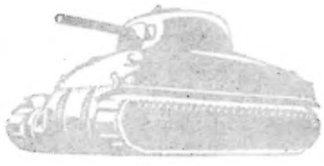
Designed for
24-HOUR SERVICE



Like Uncle Sam's latest type M-4 tank, the PENCO "3-Shift" Tool Stand is *welded* to withstand tough punishment.

Each of the three drawers locks separately — a single drawer for each shift. *Saves time, temper* and *tool losses.* Keeps 'em on the job 24 hours a day.

War industries, prime and subcontractors — write for details and prices.

1869 Penco

Penn Metal Corporation of Penna.
In Business Continuously Since 1869
26 Oregon Avenue, Philadelphia, Pa.

KEEP 'EM SLIDING

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that help to teach

SHIP BUILDING!

10 ALL-IMPORTANT SUBJECTS:

(1) Preparing and setting a keel block and bottom cradle

(2) Inner Bottom Section: Sub-assembly of a closed floor, Sub-assembly of a solid floor

(3) Inner bottom section: Setting up and fitting floor

(4) Deck Girder: Sub-assembly

(5) Side Frame: Sub-assembly of a web frame

(6) Girders: Setting transverse web frame and a horning girder

(7) Bulkhead: Laying off the boundary and stiffeners on a transverse water-tight bulkhead

(8) Bulkhead: Laying off and fitting a center line stiffener

(9) Bulkhead: Setting a transverse, water-tight bulkhead and hull

(10) Deck Plates: Regulating and setting

USE THESE 23 FILMS ON MACHINE SHOP WORK!

5 on the Engine Lathe
5 on Precision Measuring
3 on the Shaper
5 on the Milling Machine
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3 on the Vertical Boring Mill

17 OTHER MACHINE SHOP SUBJECTS WILL BE RELEASED SOON!

Now! Now! Now is the time for the training of shipyard workers! Hundreds of shipbuilders and vocational schools are using these great films!

These motion pictures were produced by THE UNITED STATES GOVERNMENT for the specific purpose of aiding you in your vital work. They were made under the supervision of experts. Leading shipbuilding companies cooperated in their making. All are available in 16 mm. Sound-On-Film.

All of these films are low in cost, to give them the widest possible distribution. All are accurate, authentic, useful tools to be used in U. S. war effort. Don't wait! Put them to work now!

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MECHANIZE THIS JOB!

Grease-caked floors quickly cleaned without damage by steel-wire brush on HILD Machine

Chipping away hard, caked, greasy grime with a hand spud is slow, tedious work . . . and is certain to scar the floor. Do this job the *modern* way . . . with the special steel-wire brush driven by the powerful HILD Floor Machine. Even heavily caked deposits of metal shavings and grease come away quickly when this machine goes to work.

Once the floor is clean it can easily be kept that way by the same HILD Floor Machine equipped with the special Shower-feed Scrubbing Brush. Following with the HILD Vacuum Pick-up dries scrubbed floors almost instantly . . . banishes the slip-hazard of wet or dirty floors. Our free circular gives complete information. Send for your copy today!

HILD FLOOR MACHINE CO.
Representatives in 48 States
1313 W. Randolph St., Dept. FM6, Chicago, Ill.

PRACTICAL SUBSTITUTES FOR *Tin Base* BABBITTS

Magnolia has developed two new lead-base bearing metals which effectively "pinch hit" for tin-base babbitts. These, together with Magnolia Anti-friction Metal, fill practically all bearing metal requirements.

- **MAGNOLIA Anti-friction METAL** for steady, high speeds and uniform loads.
- **PYRAMID Bearing METAL** withstands extremely heavy, sustained pressures.
- **DEFENDER Bearing METAL** stands up under shock loads without cracking.

New Bulletin giving full details, specifications on all Magnolia Metals sent free on request.

MAGNOLIA METAL CO. • ELIZABETH, N. J.

MAGNOLIA BEARING METALS

BOOKLETS

THE PROFIT MOTIVE AND "MAXIMUM" PROFITS. Edwin G. Nourse. The Brookings Institution. Washington, D. C. 30 pages. 25c.

TOWARDS OUR TRUE INHERITANCE. The Reconstruction work of the I.L.O. International Labor Office, Washington Branch, 734 Jackson Place, Washington, D. C. 77 pages. 25c.

LABOUR CONDITIONS IN WAR CONTRACTS. With Special Reference to Canada, Great Britain, and the United States. International Labor Office, Washington Branch, 734 Jackson Place, Washington, D. C. 59 pages. Index. 25c.

•

ON THE CALENDAR

JUNE

5, American Management Association, General Management Conference, New York. Frank F. Gilmore, Conference Planning Manager, 330 West 42nd St., New York.

8–10, American Society of Mechanical Engineers, Semi-Annual Meeting, Cleveland. C. E. Davies, National Secretary, 29 West 39th St., New York.

15–17, American Society of Heating and Ventilating Engineers, Spring Meeting, St. Paul, Minn. A. V. Hutchinson, Secretary, 51 Madison Ave., New York.

22–25, National Association of Cost Accountants, Annual Meeting, Chicago. S. C. McLeod, Secretary, 385 Madison Ave., New York.

22–26, American Institute of Electrical Engineers, Summer Convention, Chicago. H. H. Henline, National Secretary, 33 West 39th St., New York.

22–26, American Society for Testing Materials, Annual Meeting, Atlantic City. R. E. Hess, Assistant Secretary, 260 South Broad St., Philadelphia.

27–29, Society for Promotion of Engineering Education, 50th Annual Meeting, Columbia University, New York. H. E. Walter, Chairman, Publicity Committee, Newark College of Engineering, Newark, N. J.

JULY

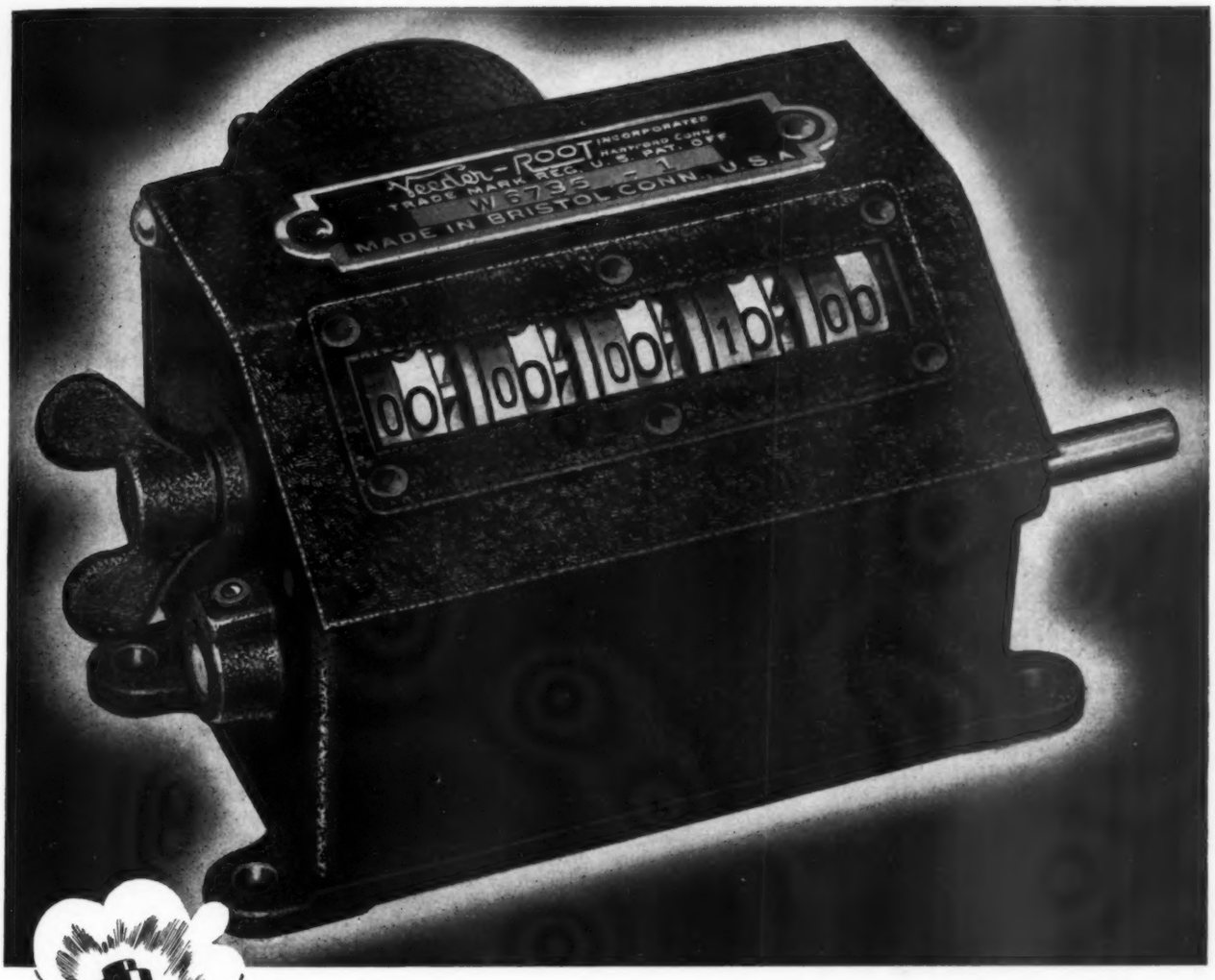
22–25, Silver Bay Conference on Industrial Relations, 25th Annual Conference, Silver Bay-on-Lake George, N. Y. E. H. T. Foster, Executive Secretary, 347 Madison Ave., New York.

UNIVERSITY SUMMER COURSES FOR EXECUTIVES AND ENGINEERS

June 8–26, Summer Management Course devoted to Production Planning, Plant Layout, Motion and Time Study, and Related Subjects. University of Iowa. Ralph M. Barnes, Professor of Industrial Engineering, College of Engineering, University of Iowa, Iowa City.

How you can

FILL EACH WAR-PRODUCTION MINUTE WITH 60 SECONDS' WORTH OF DUTY DONE...



Every minute, that goes unfilled with production, *fights on the side of the enemy.* And the best way to make sure that time is used to full advantage is to measure the clock against the work-records of Veeder-Root Counters on all production machines. Then you can instantly spot any lagging machines, and make the needed adjustments before serious shortages develop and work-schedules are thrown out of joint. One way to prevent these shortages is the use of the Predetermining Counter, above, to control high-speed machines. This counter acts to stop the machine exactly at the end of a pre-set number of turns or pieces . . . thus avoiding waste, and providing an accurate figure that serves as a time-check against the machine's full rated capacity. See how *you* can count on Veeder-Root *to make every minute's work count to the utmost.*

★ ★ ★ *Equip all your War-Production Machines with* **VEEDER-ROOT COUNTING DEVICES**

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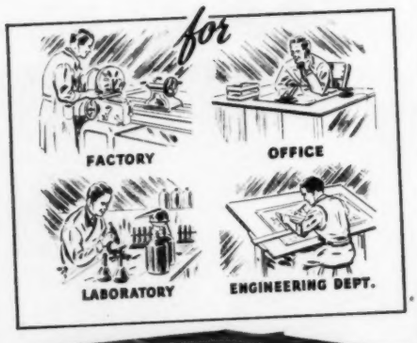
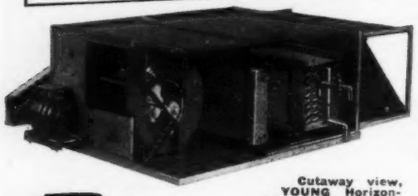
YEAR-ROUND AIR CONDITIONING





Cutaway view, YOUNG Horizontal STREAMAIRE Air Conditioning Unit.

Young STREAMAIRE AIR-CONDITIONING

Cooling . . . Heating . . . Humidifying . . . Filtering . . . complete Air Conditioning and Ventilation . . . you get them all with YOUNG STREAMAIRE AIR CONDITIONING units. YOUNG's perfected year-round air conditioning will enable you and your men to do better work and more of it. That's mighty important these days. There is a YOUNG STREAMAIRE unit of the right size and type for your particular requirements. Choose from sixteen models—eight horizontal and eight vertical—capacities from 400 to 16,625 CFM.

All YOUNG Products—air conditioning units, convectors, unit heaters, heating and cooling coils, etc.—are precision built of highest quality materials. Write for engineering data and complete information.

YOUNG RADIATOR COMPANY

Dept. 122-F Racine, Wis., U.S.A.

Young
HEATING, COOLING AND AIR CONDITIONING UNITS

THEY SAY AND DO

One Hundred Years Of Growth and Progress

One hundred years of progress! A tribute to the principles of free enterprise that are an integral part of the American way of life. That is the story of the Joseph T. Ryerson Company, which grew from one tiny "iron store" in a "country town" on the banks of the Chicago River to one of the largest steel-service organizations, with ten plants, in 100 years.

It was in 1842 that Joseph T. Ryerson went from Pittsburgh to Chicago. As far back as 1750, members of the Ryerson family had been developing ore deposits in northern New Jersey. During the Revolutionary War Ryerson mines and forges furnished some of the iron used in the chain that blockaded the Hudson River at West Point.

Early advertisements of the Ryerson company listed, "Flat bar, tire, round, square, hoop, band, saddle tree, horseshoe, boiler, and sheet iron; plough, spring, blister, English, and German steel; buggy springs, axles, wagon and Dearborn boxes; also nails, brads, cut and wrought spikes, white lead."

Today Ryerson's ten plants normally carry in stock thousands of tons of steel in more than 11,000 different kinds, shapes, and sizes.

Management of the company is still in the hands of members of the Ryerson family. Chairman of the board is Edward L. Ryerson, grandson of the founder, and his brother, Joseph T., was president during the first World War.

Many ups and downs characterize Ryerson's early days. Just before his death in 1883, the first Joseph T. Ryerson said, "I passed through the revulsion and panic of 1837; through the panics of 1857 and 1873; through the years of the war of the rebellion. Had my warehouse on Water Street break down in the interior from attic to cellar through an architectural defect, and came within five minutes of being crushed myself. Had my Lake Street warehouse twice partially burned, and my Water Street store totally destroyed by fire. Have had many hard journeys and hard times, but I never knew what it was to be scared of fate or ever to lie down under difficulties. On the contrary, I rather enjoyed fighting them."

Of such is the fighting spirit that inspires a company to live and grow for a hundred years.

•

Republic Steel Takes Stand on Union Shop

After hearings before a War Labor Board panel, the Republic Steel Corporation has made public a vigorous statement of the stand taken by the company against union demands for the union (closed) shop, check-off collection of dues, a dollar-a-day wage increase, and a minimum daily wage guarantee. These demands filed by the United Steelworkers of America (formerly known as the Steel Workers Organizing Committee) would, if granted, "bar free participation by American workers in the nation's all-out war production and would encourage inflation by raising living costs," the company contended.

"The imposition of a union shop or any modification of the closed shop deprives thousands of employees of their fundamental privilege to determine for themselves whether or not they wish to join a union. Having joined, they are deprived of the right to quit such membership by their own free will. . . . Neither should the 3500 Republic employees now in the fighting forces be penalized upon their return from war service."

The statement pointed out that many leading government officials, Congressmen, and even labor leaders have opposed the closed shop and that a recent Gallup poll shows that it is not favored by 73 percent of Americans. As for the check-off, Republic declared that "collection of dues is strictly a union function."

"The check-off means that union members surrender their control over their leaders," the statement said. "That the check-off is against the public interest is illustrated by the fact that the Railway Labor Act, as amended, contains a special prohibition against the use of the check-off in an industry which necessarily is affected by public interest.

"The union's demand for a dollar-a-day increase in steel wages is in direct conflict with the government's drastic measures to ward off inflation. . . . The increase in weekly wages in the steel industry, particularly in Republic Steel, has more than kept pace with the increase in living costs. On the basis of present payrolls a dollar-a-day wage increase would add to annual operating costs $17,500,000 for Republic and approximately $166,000,000 for the whole steel industry."

•

Army Now Enrolling Specialist Corps

With little fanfare, the War Department has begun mobilizing an "army" of industrial and business specialists. Former Secretary of War Dwight F. Davis is the commanding "general" of this operation which will eventually transfer a possible 100,000 men from private industry to military duty of a new type.

The new organization will be known as the Army Specialist Corps. Most of its members will be uniformed and will be commissioned as officers. But—and here is a paradox—*they will not be Army officers.* This strange distinction means, for example, that they will not be required to exchange salutes with members of the Army, although they must salute each other.

The semi-civilian set-up of the Corps

McCASKEY TOOL CRIB CONTROL

quickly and easily installed—employees also prefer it

*MORE PRODUCTION WITH **LESS TOOLS

* IMPERATIVE FOR MULTI-SHIFT OPERATION

McCaskey Tool Crib Control—by cutting the time required for drawing and returning tools—puts men and tools at *productive* work in a fraction of the time with checks and other systems. Multi-shift operation multiplies the demands on the tool crib. Tool service must be stepped-up to the increased pace of the plant. Tools must be available in good condition without the least delay. Lost time—and resulting lost production—of men and machines must be prevented.

Actual experience in numerous plants, large and small, is proving daily that better and faster service at tool crib windows with McCaskey Control has materially increased their production under the most severe conditions.

* * THREE SHIFT OPERATION WITH FEWER TOOLS

At the same time, the difficulty of providing sufficient tool inventory for multi-shift requirements is reduced by McCaskey. Tools not in actual use are returned promptly to tool cribs where they immediately are available for the next job. McCaskey records, totally visible at a glance, prevent the accumulation of tools at machines or in tool boxes—enable inexperienced crib operators to enforce economical use of available inventory.

Tool turnover or usage records, quickly secured, frequently reveal a surplus of important items that are difficult to secure today and indicate inactive items that may be salvaged for essential operations. Tool breakage is reduced as much as 50% and loss and theft are practically eliminated. McCaskey assures "more production with less tools"!

McCaskey Tool Crib Control can be installed to meet your particular requirements quickly and easily without the least interruption of production. Write us *today* for complete reports of results secured in several nationally-known plants. McCaskey representatives are available to render valuable assistance. No service fee. No obligations.

NON-PRODUCTIVE TIME ELIMINATED The tool supervisor of a large brass company reports: "The adoption of McCaskey has eliminated the costly non-productive time frequently wasted by both men and machines, while missing tools were located .... savings have repaid our investment many times over."

MAINTAINING SUFFICIENT STOCK FOR TOP REQUIREMENTS MORE evidence from a plant operating three shifts: "The (McCaskey) Control also provides a monthly turnover record for each tool that indicates the tools and the quantities of each to be reordered. The data is easily secured and it removes all guesswork from this important job. As a result, our *inventory has been substantially cut* but we know that we are carrying *sufficient stock for our top requirements.*"

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems, Ltd., Galt, Ontario, Canada. The McCaskey Register Co., Watford, England.

McCASKEY INDUSTRIAL CONTROLS

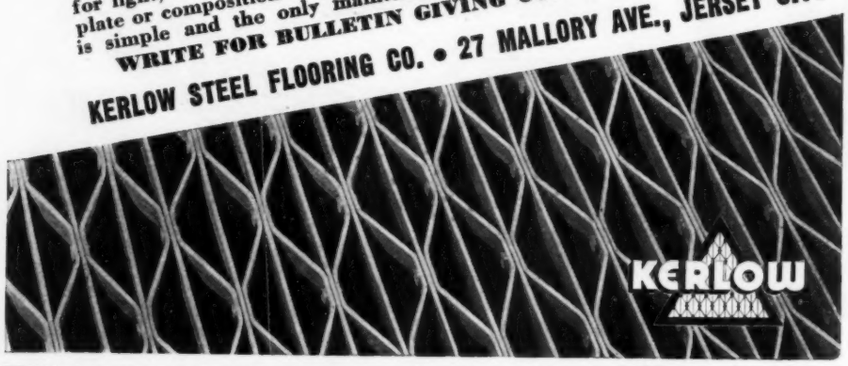
PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

KERLOW open STEEL FLOORING

There are four good reasons why Kerlow Open Steel Flooring is used so extensively in industrial plants. 1. *Safety* . . . open mesh, non-skid design provides slip-proof footing under all conditions. 2. *Light and Ventilation* . . . 85% of the floor area is open. This allows ample passage for light, heat, air and fumes. 3. *Performance* . . . outlasts wood, steel plate or composition floors. 4. *Economy* . . . first cost is low, installation is simple and the only maintenance expense is occasional repainting.

WRITE FOR BULLETIN GIVING COMPLETE DETAILS.

KERLOW STEEL FLOORING CO. • 27 MALLORY AVE., JERSEY CITY



WHEN THE BIG TEST COMES

these nuts hold tight

There are more Elastic Stop Nuts on American airplanes, tanks, and other war equipment, than all other lock nuts combined.

TEST ELASTIC STOP NUTS on *your* products and equipment. Ask for sample nuts.

» *Catalog on request*

ELASTIC STOP NUT CORPORATION
2336 VAUXHALL ROAD • UNION, NEW JERSEY

Elastic Stop SELF-LOCKING NUTS

has several apparent purposes. For one thing, the Corps can enroll men regardless of age. They need not conform to the rigid physical specifications of the Army, nor will they be required to undergo military training of any kind. At the same time they will be subject to military discipline, under Articles of War, and will have the status of members of the American armed services under the Locarno Convention regulating the treatment of prisoners of war.

The last regulation suggests that members of the Corps will see service abroad and that their duties, while non-combatant, may possibly take some of them within the line of fire.

To weed out draft-dodgers, the Corps will reject men in the 1-A classification of Selective Service and will draw from those in the 3-A and 4-F groups. Enrollment of members has already begun but those who are being taken in—several thousands within the next few months—are mainly in technical specialties for which there is an immediate need.

These include electrical engineers, radio technicians, mechanical engineers, chemists, chemical engineers, aeronautical and automotive mechanics, geologists, personnel directors, occupational specialists, statisticians, and transportation experts of all types.

Later, the Corps will begin to enroll business, administrative, and production specialists of many kinds. Highly skilled workmen will be enrolled from the beginning as non-commissioned officers ranging from corporal to master sergeant.

The rank of Corps officers will correspond to that of Army officers and the salary scale will be about as follows: second lieutenants, $2600 to $3500; first lieutenants, $3200 to $3800; captains, $3800 to $4600; majors, $4600 to $5400; lieutenant colonels, $6500 to $7500; deputy directors, $8000 to $9000.

Promotions will be made, on the basis of merit and according to the needs of the service, at the discretion of the director general. The uniforms which members of the Corps will wear will be single breasted, of olive drab, with silver buttons and maroon braid on the sleeves and shoulders. Members will be required to buy their own uniforms.

•

Employees, Stockholders Confer at Dinner

Stockholders and employees annually break bread together and discuss business in minute detail at the Macwhyte Company of Kenosha, Wis., for such has become an honored annual tradition.

Stockholders at this year's dinner viewed a series of 29 colored charts, revealing exact data on company shipments, current assets, fixed assets, liabilities, taxes, profits, and losses. "These charts," H. E. Sawyer, vice-president, told the stockholders, "give you more information than a concern usually supplies to its bankers."

Service certificates were awarded to long-time employees, and 25-year men were presented with watches.